DEVOTED TO
TEXTILE CHEMISTRY
AND
WET-PROCESSING
BLEACHING
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FINISHING

JANUARY 10, 1949
VOLUME 38, No. 1

AMERICAN DYESTUFF REPORTER

JAN 13

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Solophenyl Color series for Cotton and Rayon. Only the fastest to light carry the name.

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Geigy announces the Cuprophenyl (*) series of Direct colors for Cotton and Rayon — a series, which, when aftertreated with copper sulphate and acetic acid, gives outstanding resistance to washing, water bleeding, salt water, dry and wet cleaning and light, with light fastness and shade being minorly affected by the popular anti-crease finishes.

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*Registered U.S. Patent Office.

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INDUSTRIAL CHEMICALS DIVISION, DEPT. E
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

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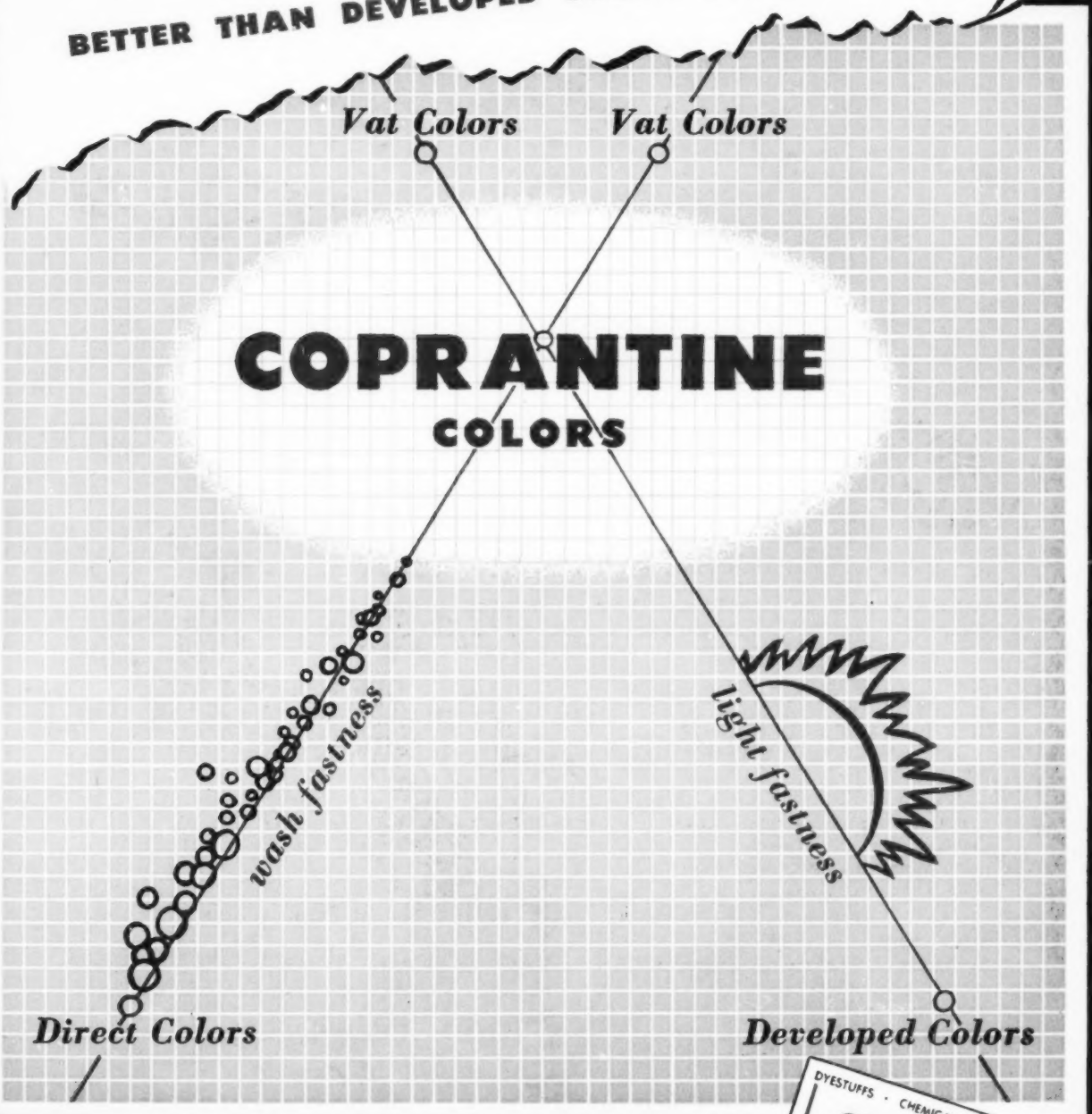

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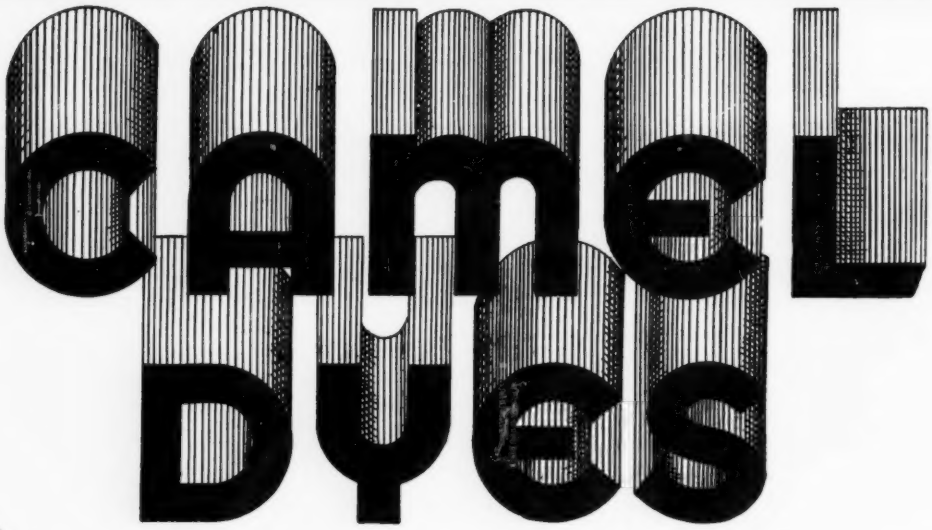

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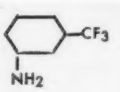
The Hooker Chemicals described below are all acid chlorides. Their properties make them of use in such varied fields as the manufacture of dyestuffs, plasticizers, pharmaceuticals, and lubricants. If you are engaged in any of these fields or in other chemical processing, some of these acid chlorides may make your work easier.

Brief descriptions and some of the uses of these acid chlorides are given below. Technical Data Sheets and samples will be furnished when requested on your letterhead. For more information consult our Technical Staff for help on how Hooker Chemicals may solve your specific problems.

HOOKER RESEARCH PRESENTS
m-AMINOBENZOTRIFLUORIDE



Molecular Weight	161.13
Freezing Point	3° C
Distillation Range	5° including 189° C
Specific Gravity, 15.5°/15.5° C	1.303
Refractive Index, n20/D	1.481

Another new fluoride from Hooker Research Laboratories, m-Aminobenzotrifluoride seems destined for wide use as an intermediate in the preparation of dyestuffs. Preliminary investigations also indicate the possibility of further nuclear substitution. The CF_3 group is usually strongly meta directing. However, in this compound indications are that the NH_2 group will have a greater directing influence than the CF_3 group. Further substitution will very likely be in the position ortho to CF_3 and para to NH_2.

The CF_3 group is chemically stable but in the NH_2 group one or both hydrogens may be substituted.

m-Aminobenzotrifluoride is a colorless liquid with a characteristic aniline like odor. It turns brown when exposed to light. At present it is available in pilot plant quantities. Technical Date Sheet 366 describes its physical and chemical characteristics fully and gives literature references. When requesting literature or samples, please use company letterhead.

PRODUCT *Chemical Formula and Molecular Weight*	DESCRIPTION AND USES
METANITROBENZOYL CHLORIDE $NO_2C_6H_4COCl$;185.5	Yellow to brown liquid partially crystallized at room temperature. Last crystal point 28° to 31° C. Manufacture of dyes for fabrics and color photography; intermediate in preparation of pharmaceuticals.
PARANITROBENZOYL CHLORIDE $NO_2C_6H_4COCl$;185.5	Yellow crystalline solid. M.P. 70° C minimum. Manufacture of novocaine, procaine hydrochloride; dyestuffs.
ACETYL CHLORIDE CH_3COCl;78.5	Clear, colorless to pale yellow liquid. Dist. R. 2.5° incl. 51° C. To introduce acetyl group into organic compounds. Manufacture of intermediates, dyes, and pharmaceuticals.
BENZOYL CHLORIDE C_6H_5COCl;140.5	Clear, colorless liquid. Boiling point 198° C. As a highly reactive acid chloride, it may be used to introduce the benzoyl group into organic compounds, especially through Friedel-Crafts reactions. It is used in the manufacture of synthetic perfumes, pharmaceuticals, dyes and resins.
PHOSGENE CARBONYL CHLORIDE) $COCl_2$;98.9	Liquified gas. F. P. — 126° C., B.P. 8.2° C Manufacture alkyl and aryl chlorocarbonates and dialkylcarbonates; Michler's ketone; dye intermediates; metal chlorides and anhydrides; pharmaceuticals; perfumes.
SULFURYL CHLORIDE SO_2Cl_2;135.0	Light yellow liquid. B. R. 2° incl. 69.5° C. Reacts with organic acids to form other chlorides and anhydrides. Chlorinating agent for chlorophenol and other chlorination reactions in organic synthesis.
THIONYL CHLORIDE $SOCl_2$;119.0	Clear, pale yellow to red liquid. B.R., refined grade, 75° to 78° C. Manufacture of organic acid chlorides and anhydrides, alkyl chlorides from corresponding alcohols. It may be used to introduce sulfur alone or in combination with oxygen.

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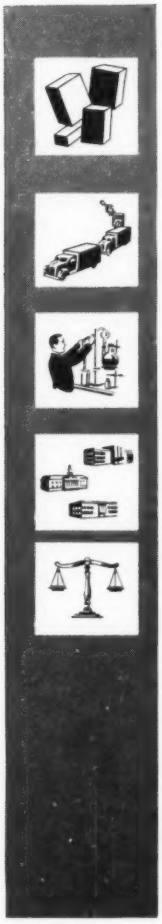

Do you know another manufacturer in New England that can offer you a complete line of products for your finishing and dyeing departments — such as chip soaps, solid soaps, cold scour soaps, synthetics, tar removers, detergents, Calex crystals, penetrants (both dyehouse and carbonizer), formaldehyde, stripping agents, etc.?

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Do you know another manufacturer in New England that has a trained and experienced staff of technical representatives capable of talking over your troubles, even to the extent of taking off their hats and coats and going to work in your mill, if necessary?

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Do you know another manufacturer in New England that can offer you all these advantages and still maintain a price structure which is equal to, and in many cases, lower than competition?

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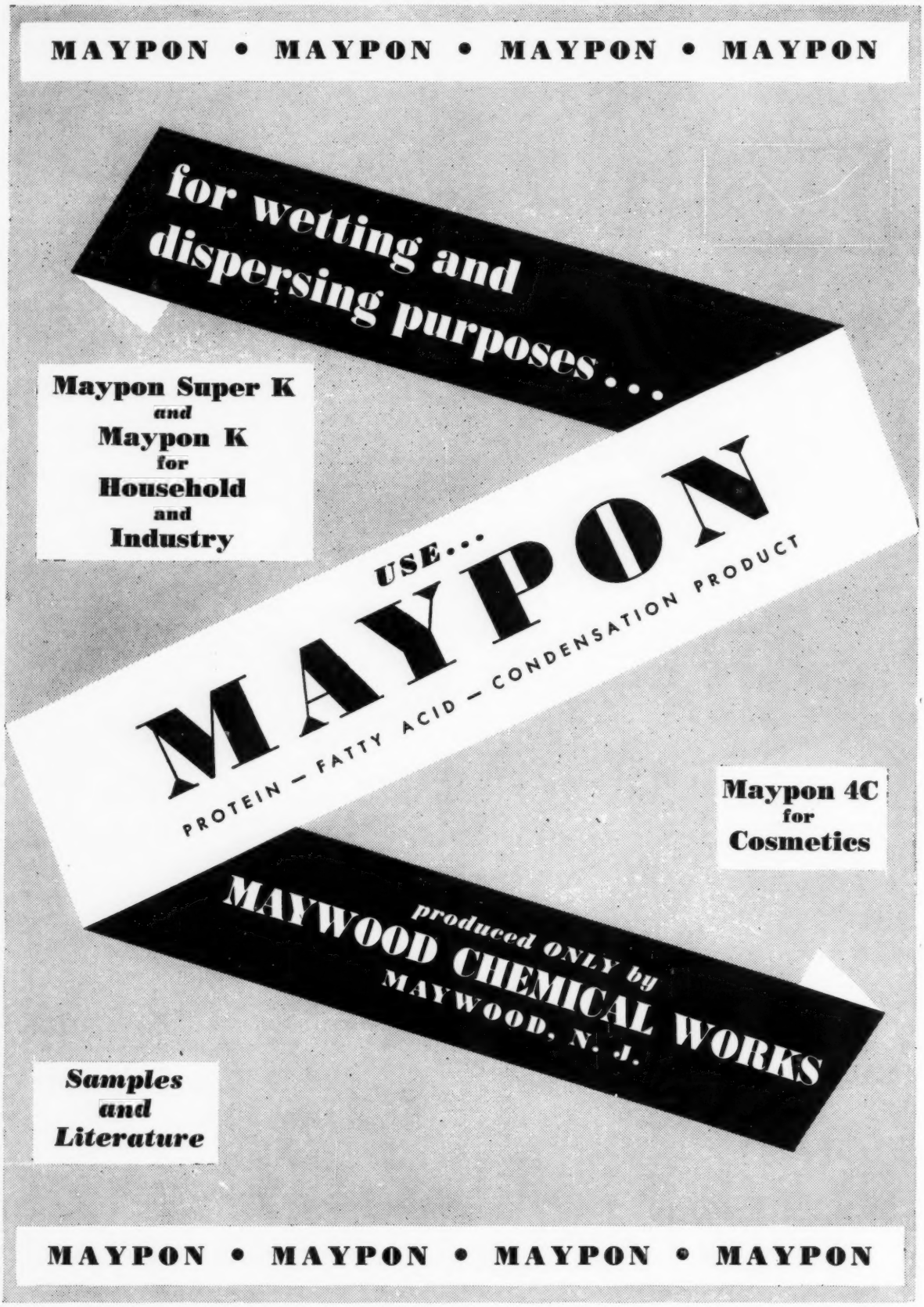
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Selected Amacid Dyes are the wool-dyer's defense against color destruction by sunlight, washing, sea-water, carbonizing, perspiration, dry-cleaning.

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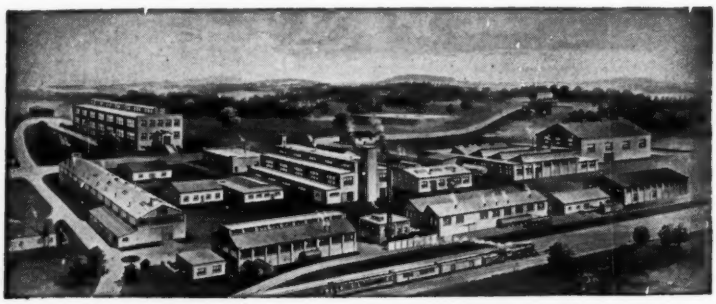

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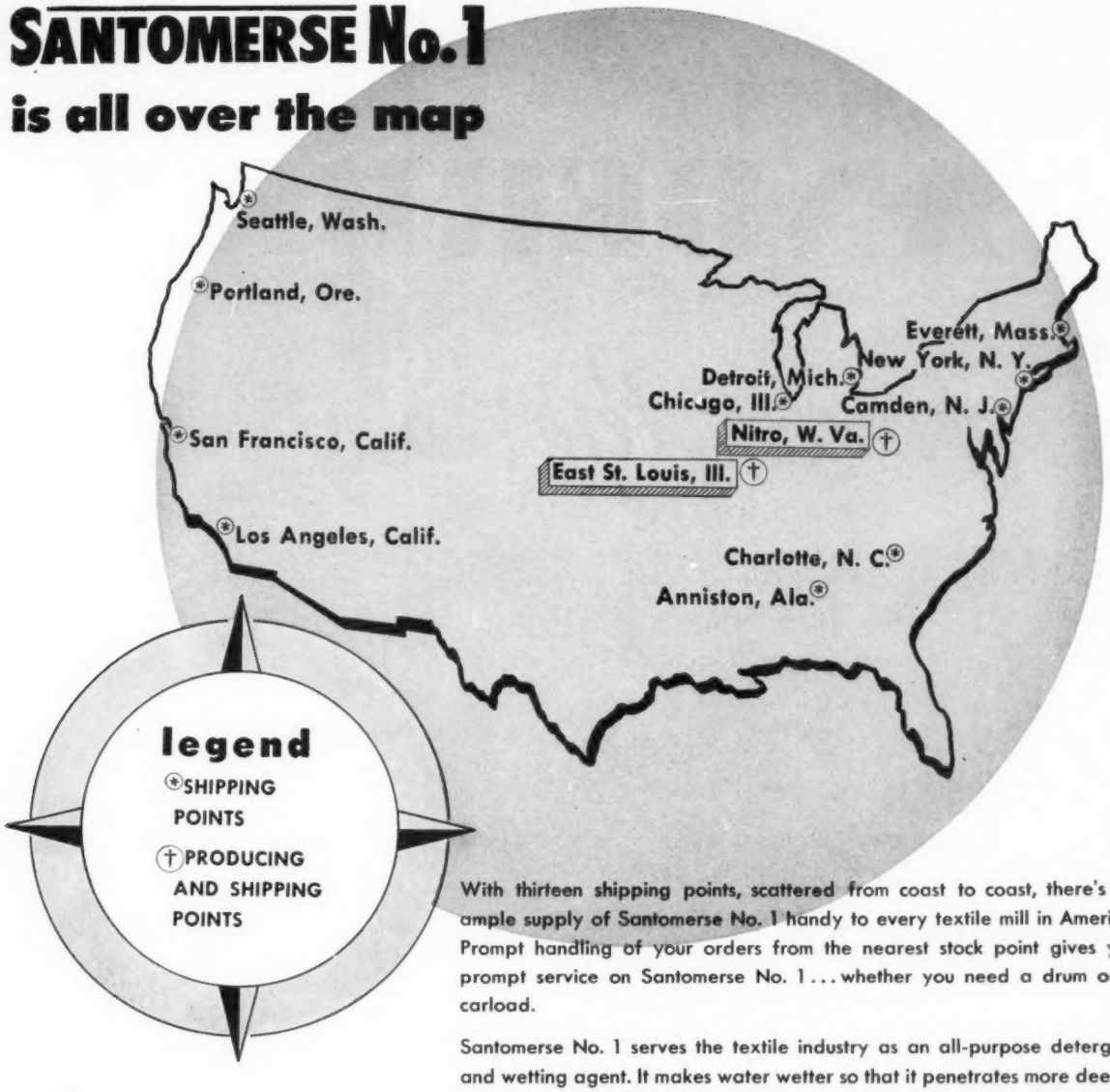

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NON-TOXIC; NON-FLAMMABLE; does not solidify, even in extreme cold.

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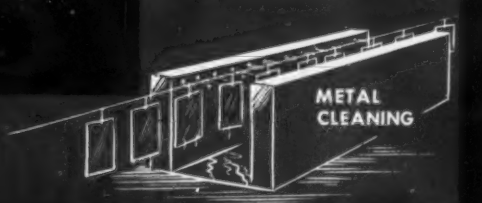

More about NYON...

NYON 218 is a clear, straw colored liquid surface active agent of the non-ionic type. It is supplied in highly concentrated form and contains no alkali.

The performance of NYON 218 is scarcely affected by the degree of water hardness. While most synthetics are effective within narrow limits, NYON 218 is efficient over wide variations in pH and temperature. It can be compounded with soap and with synthetic anionic or cationic surface active agents to improve materially many of their properties.

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SULFRAMIN E Liquid is the most economical form of synthetic detergent you can buy today. If economy is to be your watchword in 1949—start right now—order SULFRAMIN E and save!

EXTRA EFFICIENT DETERGENT

Lower cost combined with greater efficiency is like holding aces back to back. Treat yourself to a trial run on SULFRAMIN E Liquid—then relax, secure in the knowledge that your cleaning job will be done more economically and more efficiently.

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Schollerized
WASHABLE WOOL
SAFE TO TUB • SAFE TO RUB

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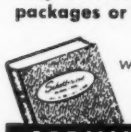

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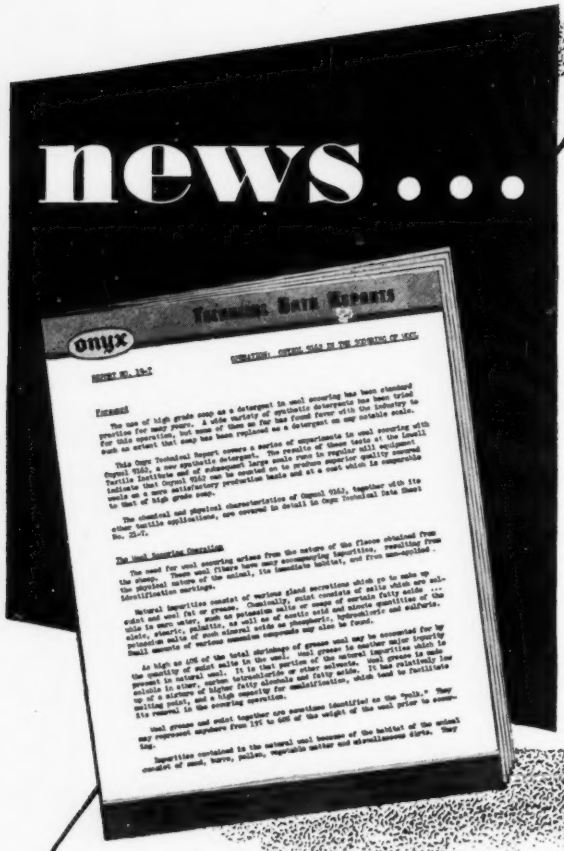

A SERIES of comparative runs with soap and Onyxol 9162 was recently made at the Lowell Textile Institute. Subsequently a mill run of 53,000 lbs. of wool was scoured with this new synthetic detergent.

Results of both tests indicate that Onyxol 9162 is superior to soap in production . . . in cost . . . and in quality of scoured wool.

You can study these comparative tests and come to your own conclusions by reading Onyx Technical Report No. 19-T.

Write for this report now. If you also want the Onyx Technical Data Sheet outlining the properties and characteristics of Onyxol 9162, ask for Data Sheet No. 21-T as well.

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AHCOVELS E, F & R do not affect light fastness or color.

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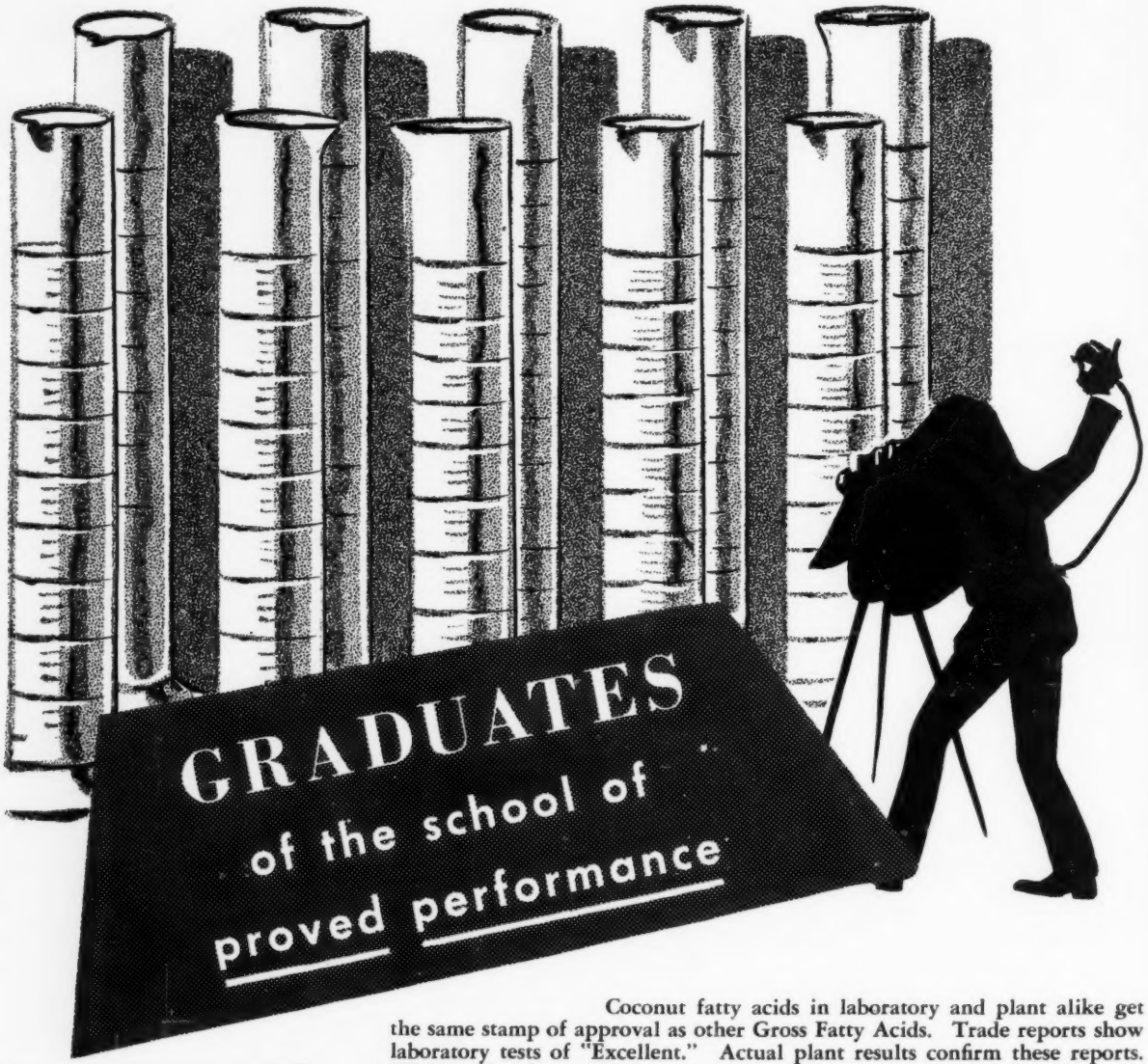

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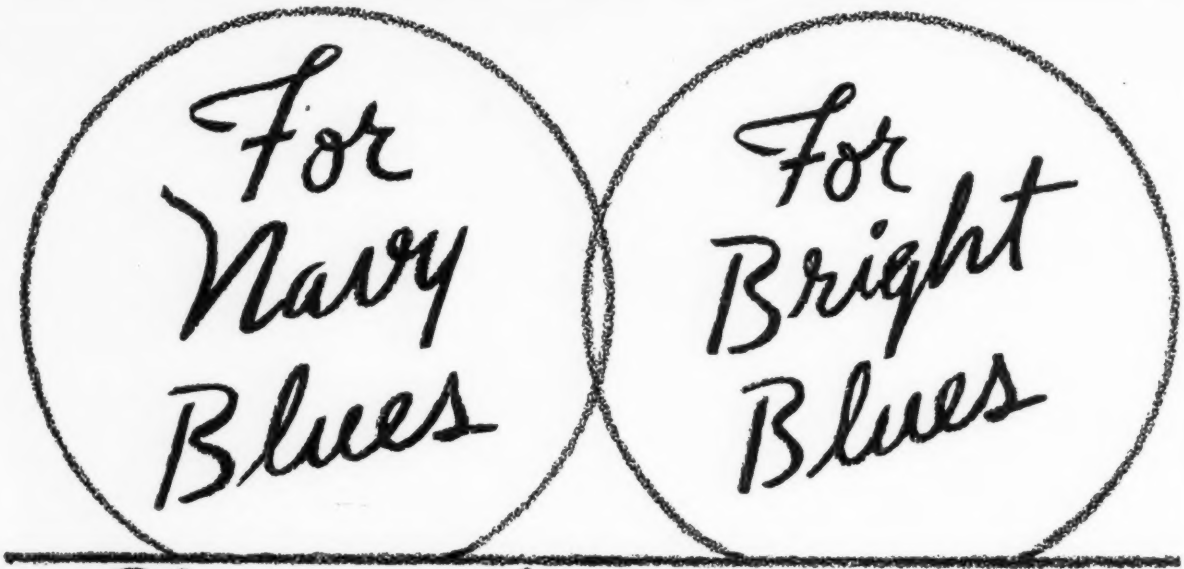

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Proceedings of the
American Association of Textile Chemists and Colorists

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January 10, 1949

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TEXTILE CHEMICAL SPECIALTIES

For Listing in

Technical Manual and Year Book

To Manufacturers of
Textile Chemical Specialties:

Again the American Association of Textile Chemists and Colorists is gathering copy for its annual "Technical Manual and Year Book". Will you therefore please prepare your

Corrections
Deletions and
Additions

for the "List of Textile Chemical Specialties" and send them to the undersigned as soon as possible? Since we must assemble material for the new book early in the year to meet planned printing schedules, it is necessary to set a deadline date of January 20th, 1949, for receipt of your copy.

May we point out here that you should not underestimate the importance of prompt and conscientious attention to this form letter inviting your participation at no cost to you. The gratuitous execution of this activity of the AATCC makes it impractical to write personal letters to over two hundred firms. However, the reputation and wide distribution of the "List" among chemists, dyers and purchasing agents in the textile industry, besides other industries in which our book is used for reference, makes the "List" too important to be overlooked or slighted.

In the preparation of the information for your products, we respectfully request that you study carefully the directions on page 276 of the "1947-48 Manual", the "Index" on page 278 and the "List" itself on page 294 and that you follow the style and punctuation illustrated. Material that is not in proper form will be returned for improvement.

This year we are trying an innovation: namely, that all information be given on 3 x 5-inch cards written up like the sample shown. Cards should be sent to me *only* for *new products* and for *corrections*, each entry being kept on a separate card. Please do not return cards for deletions or for listings that are already correct.

CARL Z. DRAVES
AATCC Publications Committee,
435 Hudson Street,
New York 14, New York.

Examples of 3 x 5-inch New and Corrected Index Entries and List Entries (shown in reduced size)

Oxidizing Agents

Peracetic Acid ACE

New Index Entry

Ace

Peracetic Acid

Oxidizing, oxidizing vat dyes

CH_3COO_2H

New List Entry

Ace

Dispace*

Dispersing Agent
Copolymerized alkylnaphthalene-sulfonate of sodium

*Registered Trade-mark

List Correction

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

48-19

Education: B.S. in textile chemistry and dyeing, N. C. State College.
Experience: Direction of textile testing and development, with some teaching.
Age 29; married; references; U. S. west coast preferred. 12-27, 1-10, 1-24, 2-7

48-22

Education: High school with night courses in textile school.
Experience: Boss dyer, with general experience, particularly wool and rugs.
Age 49; widower; references; will go anywhere in U. S. or Canada.
12-13, 12-27, 1-10, 1-24

48-23

Education: B.S., University of Bombay; M.S. expected from Lowell Textile Institute, January, 1949.
Experience: Chemist and director of dyeing, India.
Age 33; married; will go anywhere.
12-13, 12-27, 1-10, 1-24

48-24

Education: Expects B.S. in textile chemistry, Clemson College, 1949.
Experience: Two years stockman and metal worker; five years U. S. Navy. Officer in various student organizations.
Age 30; married; industrial and college references; N. E. preferred, but will go elsewhere; interested in textile resin application research. 1-10, 1-24, 2-7, 2-21

48-25

Education: R. I. School of Design, evenings.
Experience: 24 years, 10 as Boss Dyer, with same company, recently liquidated; varied experience, in particular warp, skein and package dyeing, and bleaching.
Age 53; married; N.E. preferred, as dyeing supervisor or demonstrator.
1-10, 1-24, 2-7, 2-21

Report, NCSC Student Chapter

THE North Carolina State College Student Chapter held a meeting on the evening of December 7th at which the principal speaker was Francis Burr, Monsanto Chemical Company, on "Application of Resins to Cotton."

Respectfully submitted,
JOE R. STILWELL
Secretary.

Annual Banquet Session—

ELEVEN TIMES NINETY-SIX CENTS IS BETTER THAN TEN TIMES A DOLLAR*

HUGH M. COMER
President, Avondale Mills

ELEVEN times ninety-six cents is better than ten times a dollar. The application of this fact has been the heartbeat of the success of American enterprise. This knowledge has been the stemming factor of our grand industrial history. It is saying this—that if we make eleven items at the same cost that has been required to make ten similar items, these items can be sold for ninety-six cents each; whereas, they've been selling for a dollar. This saving benefits everybody. The customers get a reduced price, the increased profit comes to the company to be divided between increased wages, dividends and surplus. The surplus to be applied back so that some day it will contribute towards making twelve items instead of ten.

A refreshed realization of this fact, and the putting of it into being, is already maintaining our present day economy. This is the type of PRODUCTION that Industry is talking about.

The best way to destroy our present day increasing prosperity is merely to depend on increasing prices to support the increasing cost of production. If, when our costs go up, we merely say to ourselves "O.K., we will raise our prices—what's it to us?" Then we start the old cycle—increased cost, increased price—increased cost, increased price—and so on, and so on, then BANG!—INFLATION. What I have said to you, you already know. As a matter of fact, expect no new thoughts from me tonight.

Now, it is one thing to know that we can better our profits by increasing production without increasing costs. Any clown knows that. However, to actually increase production without increasing costs is something else again, especially when you think you are doing pretty good already. You just can't go out into the factory and say to the superintendent: "We want you to increase your production 10% but don't increase your cost. We have got to lower our prices and maintain profits at the same time:" and then walk off. The superintendent will say "For Heaven's sake, what's the matter with this guy?" Of course, he will say it quietly to himself. To accomplish this 10% increase one has got to plan. And to plan calls for the use of imagination; intelligence—the intellect; alertness; a new research of ALL KINDS; a willingness to depart from accepted standards.

Animals listen to and work at things that are already in existence. Man creates sounds and scenes. Get out of the pattern of conformity.

I'm tired of hearing about the virtue of patience. I need a little *impatience* in my business.

I like people who are not content to do a job as it's always been done, if there's a better way. And I like men who are impatient with anything but the best methods and materials. The main thing that this planning calls for is the use of MEN—fine men; smart, keen, alert, intelligent, imaginative men. Present day machines and methods are not going to create eleven over ten. It's going to take men—men such as we have just described.

(The incident I am going to relate is factual, the name is fictitious).

A few months ago I was visiting one night in one of our mills. I saw a man performing a job that was backbreaking, but it was the job. We have a slogan in our mills: "Make every job a good job." This slogan is addressed not merely to the management but also to the worker. So I said to this man—he is my friend, a young man who was raised in the mills—"Buddy, it looks like that's a tough job you have got there; that's a heavy weight you are lifting. Why don't you think about this a little bit and see if you can't make this job easier and lighter for yourself?" Between ourselves, we started a little discussion about what could be done about a better method of handling this material. While we were at it, some of the other men in the department came up to listen and join in the conversation. We left with the idea that Buddy would think about this job in its routine and would draw up a plan and put it in the suggestion box, and if the suggestion was accepted he would be paid for it according to our "suggestion plan." Sometime later a sketch showed up signed by Buddy. It was a mess and was of no value. However, it had become apparent to us all that something should be done about relieving the physical strain in the work required in Buddy's job. So when Buddy's sketch came in it was turned over to Mr. Bales, whose job it is to work out material handling problems. Mr. Bales tried to keep Buddy right into the picture and fully aware of all the developments that took place while the research to make Buddy's job a good job was going on. He wanted to give Buddy full credit for the development of the plan. Before very long up comes as beautiful a set of plans as only an engineer with imagination and training can draw. They showed a definite relief from the physical effort required of the job. I spoke to Buddy about it, complimented him. But Buddy, clean and honest, said to me: "This is not my plan. Mr. Bales drew it. He carried me along with it. I didn't realize just what could be done about this job, but he did and he made the plans. So, Mr. Comer, I think we ought to give him full credit. The job was over my head."

Buddy is exactly right. The job was over his head. Buddy, loyal, honest, a fine worker, lacked that imagination that comes with training. Native ability—he had, plenty of it—but just native ability will not make eleven over ten. Buddies can't turn the trick. Buddy's problem is our problem and we must work at it. There are many solutions—but that's another story. Training on the job is one of the best methods of training.

Management

If ever the destiny of the industrial worker, enjoying new high wage levels, was in the hands of management, it is today. Management owes it to those fellows, whose lot is cast with them, not

* Presented at Annual Banquet, Augusta National Convention, Augusta, Ga.

only to protect but to increase their wage levels. One of a worker's most unfortunate industrial experiences is to be the victim of bad management. Management just MUST be good.

What's management's job? Its job is to create production that will sell at a profit without, as my brother Donald said many years ago, any exploitation anywhere along the line.

Several years ago I was in the Connecticut plant of one of the then medium big companies in the United States. I found employed in this plant two fine young men. One, a native of Georgia, the other of Alabama, both graduates of Georgia Tech. "Why, I asked them, are you two fellows up here? Why aren't you down home in some of our companies?" "We came here, they said, because we were offered better jobs than we were offered anywhere else." Since that date I have watched that company grow into one of the biggest in the United States. And I think it was because of the philosophy of using these two men, and dozens like them. The philosophy of bringing men like these into the company without having any particular production job, just to lok around, more or less. Watching, and thinking, but full of developing plans back of, and above their ears. Now these two men, and dozens like them, have developed machines, materials, plans, products of all types, so that company today is making not eleven instead of ten but, I guess in many instances, a thousand where they were making ten; making things today they never hoped to make, never even knew could be made, never even thought about—fifteen years ago. It seems to me this proves that men have got to come before machines. Over the years this company has increased its production and its productivity, and has marketed the production at a profit. Many times have they developed eleven over ten and have done it through MEN. This company is the United States Rubber Company.

I am the President of the University of Alabama Alumni Association. Part of the program for this year is trying to get the thought firmly in the minds of Southern Industry that it needs our graduates and will benefit from them as did our friend in Connecticut. It takes courage to put men on your pay roll, not in the line of production, to make a product the components of which you now have no knowledge, or to run machines that haven't even been developed—but to a degree that's exactly what I am driving at. I would like to quote from the Bible, the letter to the Hebrews, Chapter eleven, Verses one and two:

"Now faith is the substance of things hoped for, the evidence of things not seen.

For by it the elders obtained a good report."

Mechanization

One of the factors in the planning of ten plus one — eleven is mechanization. And, by the way, we are just dirty with mechanical plans. My Goodness! What's going on in our industry in experimental mechanization! Our research test tubes and machine shops as you well know are full of things.

Cotton

Cotton—everything about the cultivation of cotton must mechanize. Its got to mechanize. This complete mechanization of the production of cotton is sure to take place because IT HAS TO TAKE PLACE. A man hoeing cotton today with a hoe in his hands can't earn enough money to buy the second pair of overalls made out of Avondale Denims. To do that he must have mechanical implements in those hands. And he will. The bell cords over the back of old Beck are changing into steering wheels of fine, light and maneuverable tractors, pulling sharp plows and harrows. The slick hoe-handle is changing to a hose nozzle shooting flames that are burning out weeds. The pickaninnies are changing to a Martian-looking apparatus traveling under its own power down the long white rows of already defoliated cotton stalks and pulling in the soft fibers with whirling spindles. A new prosperity is coming to hand.

This prosperity is a result, not of damaging exploitation, but of a fine intelligent development. It will be new and something we all want to see come to pass. We have a brand new wealth at our door, and this wealth comes without involving any market or economic migration. It is a new wealth in a new market. We are about to get really rich, and soon, maybe by next Saturday night. Then we will be dealing out denims and dresses like never before.

IS IT TRUE WHAT THEY SAY ABOUT DIXIE?

New south steams up for big industrial era.

Dixie wage gain laid to growth of big industry.

Many farmers ready to buy machines, autos.

Many brand new businesses in state established—and on and on.

INDUSTRY IS READY.

Displaced Persons

I was talking to a rubber worker at Gadsden the other day. He was telling me that a few years ago he did well to make ten tires in a unit of time. Now he makes a hundred tires in the same length of time. Did this mechanization displace persons? This rubber worker doesn't think so. He told me that the rubber workers no longer fear any mechanical improvement that comes into their plant because the yhave found these improvements create jobs. And certainly we in spinning and weaving have developed that fact. We have many more people on our pay roll today than we had several years ago even though we are operating, I expect, as modern machinery as any mill in the country. We have discovered many new uses and new areas for our production through modern mechanization. Textile mechanization has created jobs.

The complete mechanization of cotton production at today's wages produces seed cotton ready for the gin at 8c a pound. That has been proved here in Alabama. If mechanization of the crop can put cotton into the mill at even twice that cost it will open the use of cotton to areas never before dreamed of and thus create for the cotton economy a new untold wealth. This wealth will in turn stimulate a research, the like of which has never been known, and this research will create additional uses and markets, which will in turn bring a new wealth, and this wealth will change cotton farmers from slaves to present day tools of King Cotton into Princes of the Palace of this FINE KING to which we are all so closely tied. With mechanization comes into being eleven times ninety-six cents is better than ten times a dollar. The complete cycle to me is thus:

MECHANIZATION — EFFICIENCY; EFFICIENCY — PROFITS; PROFITS—WEALTH; WEALTH—JOBS. Then back of the cycle and on and on. JOBS—WEALTH; WEALTH—PROFITS; PROFITS—EFFICIENCY; EFFICIENCY—MECHANIZATION. There is a complete cycle, and it rolls on and on. Inefficiency creates poverty in one fell swoop—and poverty is a mess.

Research

COTTON — KING OF WATER REPELLENT FABRICS.

"No . . . the square peg won't fit."

"For the same reason that many of tomorrow's miracle fibers won't take the place of cotton. . ."

"Because cotton is a 'natural' for a hundred and one industrial and consumer needs—naturally tough, flexible, resilient, absorptive, durable, easy to handle, inexpensive. . ."

"In the hands of the experienced cotton man and fabric engineer, these properties can be used to design cotton products that will fit almost any special industrial need. . ."

"And it is this ability, together with a

progressive alertness to research, improved manufacturing methods, modern equipment, and an understanding of end product uses, which is building as broad a market for cotton in the world of tomorrow as it has in the worlds of yesterday and today.

COTTON'S MANY QUALITIES NEED EXPLOITATION.

COTTON COUNCIL STUDIES COMPETITIVE END USES.

MUCH WORK AHEAD IN FINISHING RESEARCH.

THE SITUATION BEARS WATCHING.

"All kinds of new fibers and blends are ready for release—not to mention new finishes and processes. The whole textile picture is changing very quickly—all the way from the mills to the markets."

RESEARCH WILL SHOW THE WAY. RESEARCH AND ENGINEERING.

"THE ONCOMING CHALLENGE TO COTTON"—Cotton is the most important fiber known to man. (George Sloan). Watch out for Cotton. It's a "dice shooting natural."

There are two mechanical cotton pickers here in our county at Sylacauga. They are operating in the cotton fields this season. The success of the cotton pickers up to now has bene limited, and here is why.

The cotton stalks themselves, because of their varying sizes, branch structures and foliation, hindered considerably the activity of the picking spindles. Also the stalks were not free enough from green vegetation, such as tall grasses and weeds. In some instances, however the fields were planted with cotton seed that had been so developed that they would produce plants that would lend themselves to the requirements of the mechanical cotton picker. The stalks were more or less uniform in size, limb structure, foliage and height, and the farmer had kept his crop clean. In these fields the mechanical picker did a grand job.

This is the same condition that faced the mechanical corn harvester at its inception. We all remember the old corn fields, little stalks, high stalks, short stalks, all kinds of stalks. The mechanical corn harvester didn't have a chance. Now a seed corn has been deveoped—and, by the way, I am afraid old Henry Wallace, himself, had something to do with this development—that produces corn stalks that are uniform in size, height and other physical structures, Now you can look over fields of corn, the top of which is as level as a lake, and the corn harvester goes to town.

So this mechanical cotton picker is going to develop two areas, agriculture and machines. It is going to put pressure on agriculture to produce a cotton seed that will produce fine cotton plants and more of them. That will develop the cotton picker itself and make the work of the mechanical picker more simple. A team will be created—agriculture and machines.

One of the largest areas for chemistry research is in the present method of separating lint from seed. If ever a process was cruel, it is the ginning process, which is simply snatching the fiber off the seed through use of circular saws passing through narrow slits between steel bars. This seperatation of seed from fiber should certainly be done through some sort of chemical activity that you fellows set up and, for Heaven's sake, you fellows start setting it up. Our fiber is being messed up at the gin. Cotton is one of the few raw materials that is handled through the whole process of fabrication in its raw state, that is, before it is refined—everyone knowing at the beginning that it has got to be refined. Think what would happen if the spinner and weaver could get hold of their lint after it had been freed from its waxes and other impurities. It would make spinning and weaving a pleasure; something we would enjoy instead of being continually buttoned up with slugs and sowbellies.

You can see that I have a lot of heart in our cotton fiber. I have also got a lot of heart in staple fibers. I believe though that there is room for the fibers in this tremendous economy that we are in. In many instances they are thoroughly complementary one to the other.

Here's a letter from a man saying that we can easily develop a market for 20 million United States grown bales of cotton.

"January 16, 1948

Mr. Hugh M. Comer, Director
National Cotton Council
Sylacauga, Alabama

Dear Mr. Comer:

Means have been developed which can establish a stable market for 20 million bales of United States grown cotton fiber per year.

The 'resin bonded card web' process is used to produce utility fabrics for particular uses. Resin banded cotton fiber structural material can compete with wood and all other market building materials now being used for the entire outside and inside of prefabricated homes and in industrial buildings of special design."

Cotton and You

Every day . . . Enjoy COTTON FRESHNESS.

COTTON—tough, lasting. . .

SIMPLE—easy to wash. Cotton can take it.

HEALTHFUL—Outside freshness helps maintain inside health.

THRIFTY—Cotton more than repays, long wear sturdy service.

YOU and COTTON—You Two can do a mighty lot for each other.

"COTTON FACING SITUATION UNPARALLELED IN HISTORY."

"COTTON HEADING TO ALL-OUT WAR." Those are two significant headlines.

When a man is in trouble he needs a friend. "Old Man Cotton" is a man now. A true man—a tried man—a man who has served a useful purpose a long, long time. "Old Man Cotton" is in trouble now, bad trouble. Cotton's scared—bad scared. But cotton's fighting—fighting hard. Cotton's strong—very Strong. But Cotton needs friends Good friends—Strong friends—friends like you. Get in there and give Old Man Cotton a hand. Cotton deserves to win. Cotton will win. Make Eleven Times Ninety-Six Cents Better Than Ten Times a Dollar.

CALENDAR

WESTERN NEW ENGLAND SECTION

Meetings: January 14, February 25, April 8, May 20.

NEW YORK SECTION

Meetings: January 28, March 4, April 1, May 6.
Outing: June 17.

PHILADELPHIA SECTION

Meetings: January 28, March 11, April 15, May 20, September 16, November 11 (Kugler's, Philadelphia).
Outing: June 10.

PACIFIC COAST SECTION

Meeting: February 11 (Mona Lisa Restaurant, Los Angeles, Calif., "The New Look in Textiles," Raymond W. Jacoby).

PIEDMONT SECTION

Meetings: January 29 (Poinsett Hotel, Greenville, S. C.), April 2 (Robert E. Lee Hotel, Winston-Salem, N. C.), June 24, 25, 26 (Ocean Forest Hotel, Myrtle Beach, S. C.), November 5 (Charlotte Hotel, Charlotte, N. C.)

COUNCIL

Meetings: January 28, March 25 (Hotel New Yorker, New York).

RESEARCH COMMITTEE

Meetings: January 28, March 25 (Hotel New Yorker, New York).

NATIONAL CONVENTIONS

1949: October 13 to 15, Chalfonte-Haddon Hall, Atlantic City.
1950: October 19 to 21, Statler, Boston.

Pacific Coast Section—

CURRENT DEVELOPMENTS IN DYEING AND FINISHING*

L. S. THOMPSON

General Dyestuff Corporation

THE foundation of successful end results in the dyeing and finishing industry is the interest of persons designated by management to keep abreast of newer methods of application, either chemical or mechanical. The inefficiency of early methods of dyeing and finishing has been realized with the introduction of the synthetic fibers, giving a challenge to chemical and textile machine manufacturers. In recent years color fastness and durable finishes of dyed textiles have become of utmost importance, and to meet this demand finishing plants have had to streamline production and eliminate inefficient methods. A general review of some new methods will be appropriate at this time.

Desize

Fabrics of rayon today are usually woven without starch, and therefore do not require the lengthy desizing operation. However, should the dyer find starch present, the customary procedure of saturating with enzymes and washing is necessary. A new development for flat fabrics is to pad the enzymes, plus a wetting agent, at recommended temperature. New enzymes applied at high temperature, 160° F., are recommended. This is followed immediately by running through boiling salt solution on a Williams Unit. The pad steam process also is suitable for this new method.

Boil-Off Units

The main boil-off takes place in the dye beck or jig. However, the new presetting machines give a preliminary partial boil-off. Such machines are indispensable for many spun rayon plied yarn fabrics to eliminate creases, and to obtain relaxation. We refer to those machines having large tank capacity into which the cloth enters in a relaxed form and is conveyed through the scouring bath. The new drum-type machines perform the same functions and are adaptable to filament fabrics. These machines perform their function best when supplemented by a thorough rinse or complete scour in tandem. It is readily understood that material when taken off without this supplementary treatment cannot be stored any length of time, because impurities tend to distribute themselves unevenly on the fabric during drainage.

Clean goods on the other hand supply an abundant back log for the dyebecks and curtail the time of goods in the dyebeck. The scouring baths used for presetting are preferably made up with synthetic detergents that are stable to hard water. A satisfactory formula is one pound of synthetic detergent plus two pounds of tetrasodium pyro phosphate per hundred gallons. The scouring bath proper is also made to the same concentration; the time factor and agitation in rope form give the required mechanical action for thorough scouring.

Fabrics that do not require presetting are handled on the rope scouring range or directly in the dyebeck. For flat goods, the boil-off can be accomplished directly in the jig or in open width washers of the multi-compartment type, with the same detergent concentrations. It is found that the majority of sightening tints are removed by these treatments; difficult cases of tints are usually given individual treatment such as cold water wash before presetting (open width), or an addition of hydrosulphite in the presetting unit.

Bleaching

For special lots that require a full white, the use of peroxide in the dyebeck is most satisfactory. For large runs continuous methods should be employed. One application is to pad goods in grey with a cold buffered peroxide bleach, and a synthetic detergent which acts as a penetrant. After padding, goods must be allowed to stand several hours before scouring in continuous form. The detergent that was employed as a wetting agent becomes a scouring agent in the hot rinse. For small lot flat fabrics the standard peroxide bleach would be satisfactory and is carried out on the jig.

Peracetic acid for the bleaching of acetate and/or viscose rayon is appearing to be of interest. It has been found with this that a reduction of ends on the jig is possible, and that equal, and in some cases superior, whites are obtained as compared with peroxide.

Dyeing

Dyeing of rayon in the dyebeck or kettle by the single strand or piece is more or less standard practice in rayon dye houses. However, for plants that have yardage sufficient to employ the new presetting machines which scour and deliver to the dye kettle in large amounts, the threading up by the continuous method of the conventional kettle for dyeing has increased production to a large extent. This continuous threading is accomplished by installing two or three pot eyes at a convenient angle on each end of the kettle. the lacing or threading up is done by throwing the first end over the reel and following in spiral direction, leaving sufficient material in back of the reel for even pleating. When the reel is filled to capacity the ends are taken through pot eyes and sewed to form an endless strand. Upon completion of dyeing, the seam is broken and goods are taken out also in continuous form ready for scutching and vacuum extraction in open width form. This arrangement cuts handling to a minimum and speeds production.

The development of direct dyeing cellulose acetate dyes has made it possible to produce a good range of depths and shades on various constructions of acetate fabrics. However, it is well known that gas fume fading, perspiration and wash fastness are still important problems, especially in blues. To overcome these it is necessary that the dyer select his dyestuffs with great care. For those fabrics in which light fastness is not required, azo blues offer the best solution; but a high temperature is necessary in dyeing. For light and medium shades selected anthraquinone dyestuffs assure maximum fastness to light and some fastness to atmospheric fading.

The introduction of permanent inhibitors has improved fastness to gas fading. These are usually applied in the bath, and the material is treated at 110° F. for

* Presented at meeting, Pacific Coast Section, October 15, 1948.

about 20 minutes before dyestuff is added. Dyeing is then carried out in the normal manner. Some plants have found that further application of an alkaline inhibitor in the finishing operation gives added protection.

Today acetate yarn is being dyed in the package machine with formic, acetic and sulfuric acids as swelling agents, together with selected acid dyes. Patent No. 2,249,607, held by L. Galatioto, gives details on the use of selected acid dyes with the acids mentioned.

An application of this method by padding has also been worked out using formic acid and selected acid dyes. As in the package machine, this produces shades of excellent fastness.

One of the well-known chemical companies is about to introduce another development for dyeing of acetate by the solvent method, to be known as Dytron. The primary purpose of the Dytron Process is rapid continuous application of acid dyestuffs to cellulose acetate fibers. The equipment necessary is a conventional padder, with small dye pan connected in tandem with four open width wash boxes. These are used as follows:

No. 1 Box—Running cold water
No. 2 Box—Bicarbonate of soda
No. 3 Box—Detergent rinse
No. 4 Box—Running cold water

Speeds as high as 60 yards per minute have been used to produce shades of medium depth. The wash fastness, crocking, gas fume fading and light fastness of selected acid colors applied in this manner have shown good promise.

The general method for application of developed black on all acetate or acetate-viscose piece goods, with both dispersed and soluble dyes is well known as a lengthy operation, in most cases taking about eight hours.

In an effort to cut down this lengthy operation, a method has been developed wherein the eight hours can possibly be cut to six or less.

The dye is dissolved or dispersed as usual and added to the bath at 130° F. The temperature is raised to 190° F.-200° F. and the goods are run at this temperature for 45 minutes. At this point the steam is shut off, one-half as much Developer O.N.S. as dyestuff used is added, and the goods are run for an additional forty-five minutes. If after 45 minutes running in the cooling bath the temperature has not dropped to 120° F., cold water may be added.

Diazotizing and developing are carried out simultaneously in the original dyebath by adding 4 to 8 per cent hydrochloric acid 20° Be., at which point the bath should have pH of 2.5, running the goods for 15 minutes, then adding 6 to 8 per cent sodium nitrite and developing for 20 minutes.

The bath is flushed clear and goods aftertreated as follows:

1) All acetate material with ½ per cent Igepon T Gel and 2 per cent hydrosulfite for 10 minutes at 160° F.
2) Acetate-viscose mixtures with ½ per cent Igepon T Gel, for 15 minutes at 140° F.

This process has also proved of interest for the dyeing of fast blacks on nylon.

In dyeing nylon piece goods it has been found that presetting with dry heat gives unusual dimensional stability preventing the formation of permanent wrinkles during scouring, dyeing and finishing. This setting is accomplished by passing the fabric over heated rolls, or it is entered into an enclosed tenter frame at temperatures as high as 450° F. for a matter of seconds.

Saturated steam also is used for presetting, with pressures as high as 15 to 30 lbs. for a period of three to five minutes. Plants that do not have these facilities may subject the material to boiling water for periods of ½ hour to 1 hour depending on the type of fabric being processed.

Acetate dyes have been used for nylon because of their excellent levelling and covering properties; but the fastness of this type of dyestuff to light and washing leaves something to be desired.

With the use of selected acid, chrome and pre-metallized colors, it has been possible to produce outstanding fastness. Selected acid colors, used in the covered jig and dyed at the boil at temperature of 210° F. on the jig roll, have produced very good results.

Stablized Finishes on Rayon Piece Goods

It is of interest to summarize recent progress in the stabilization of rayon fabrics, a field of increasing importance. The major developments are:

1) The introduction of urea-formaldehyde and melamine-formaldehyde, which increase the wet strength and decrease the tendency to shrink, while giving the well-known anti-crease finish.

2) The use of the formaldehyde reaction to reduce swellability and to increase the wet strength of viscose rayon. Within the past few years Glyoxal, a formaldehyde derivative which can be cured readily at high temperatures, has been employed with considerable success. The Glyoxal Method is known to the trade as Sanforset.

3) The introduction of the caustic alkali process known as the Definized Process.

For extreme versatility the urea and melamine formaldehyde resins, when properly handled, produce a wide range of shrink resistable finishes applicable to various blends. The method of handling is similar to the Sanforset Process, but the degree of control is not as great. One of the drawbacks of these resins is so-called chlorine retention, usually taking place in laundering. Chlorine retained by the resin may tender the goods and cause yellowing of white materials. The new comer in the formaldehyde resin group, which due to its chemical structure can be termed non-chlorine retentive, is acetone formaldehyde. It is applied in practically the same way as urea and melamine.

One disadvantage of this product is the tendency to yellow whites during drying and curing operations. When it is properly applied, stabilization and wash fastness are very good.

For the application of the Sanforset or Glyoxal Process it is essential that the fabric be thoroughly prepared, free of oils and sizes. It is bleached or dyed with selected direct or vat colors, and dried; then treated by padding through a solution of Glyoxal with an acid catalyst, and dried immediately on a tenter frame at ½" to ¾" over the finished width. It is necessary to cure this framed material for a short time at elevated temperatures, usually on a loop dryer, to obtain relaxation. To remove surplus chemicals it is then advisable to wash slack in rope form with a detergent plus a small amount of alkali. The last operation is to short frame, which removes wrinkles and establishes finished width.

The third method consists of impregnating with a protective colloid, and drying; then passing through concentrated caustic soda solutions and neutralizing immediately in a bath of sulfuric acid or sodium bicarbonate, followed by rinsing. This process, known as Definizing, has been used to good advantage for certain fabric finishes. The material is generally treated in the greige state, and the usual scouring, dyeing, and finishing operations should be carried out with minimum tension.

The overfeed pin tenter frame originating in Great Britain is acknowledged to be much superior to the conventional clip type frame. This is being used in the States at speeds up to 80 yards per minute, with an overfeed of approximately 15%. This frame is equipped with an automatic guider to feed the cloth to the pins, where a balanced air flow delivers air to both sides of the fabric. It is known that the handle of any fabric is improved tremendously by control over dimensions and by the use of this type of dryer. For spun rayons alone, or in blends with wool, cotton, or acetate, finishes of excellent textures are produced.

Machinery

New types of automatic jigs have been introduced in the past few years to meet the requirements of piece goods dyeing. The outstanding features of these machines are:

A. Automatic reversing (and in one instance automatic stopping with self-acting passage-counter).

B. Simultaneous drive of both batching rollers.

C. Practically constant cloth running speed.

D. Efficient expanders.

E. Easily attended lever for inexpert operators.

It has been found that with the jig covered, the normal temperature of 160° F. on the batched roll is increased to as much as 210° F., enabling the dyer to produce finished work free of shaded selvages such as are found in light weight acetate sharkskins, acetate taffetas, and nylons. The cover insulates both the batched roll and the space above the dyebath from the atmosphere, thereby reducing loss of heat to a minimum.

Use of the dye padder has become of great importance in the modern dyehouse. The possibilities this type of equipment offers the dyer of piece goods are the application of direct colors, vat pigment, some acetate colors, sulfur colors and naphthols.

There has been a tendency to increase the size of pad rolls and to use stainless steel, rather than rubber, for the bottom roll. Better pressure control across the face of the rolls has been attained, as in the microset type of pad. Pad boxes made of stainless steel, which are readily cleaned, are in general use today. Yarn unevenness, or tight weaving of fabric which makes penetration difficult, is often handled by padding in the greige, and boiling in the dyebeck with addition of salt. The theory is that pressure of the rolls drives color into the fiber, so that when treated at the boil in the dyebeck with salt it is dyed on the inside as well as the outside at approximately the same time. In normal beck dyeing this action takes place from the outside in, and on difficult constructions the dye does not always penetrate thoroughly.

The introduction of the Duplex dye beck has been an outstanding development. The name Duplex implies that two dye becks are arranged as one unit. The object is to treat material in endless rope form over rotating companion reels which rotate in outward directions. The liquor ratio of this type of machine is lower than in the conventional reel. The ease of threading, rapid change of temperatures due to lower ratio of liquor, and the minimized damage of fabric due to friction are the principal features. This type of machine is being used for bleaching, washing or dyeing.

We have mentioned continuous rope dyeing followed by vacuum extraction, accomplished by taking wet material from the dyebeck opening by scutching, and drawing under tension across a pipe with slots using air or steam vacuum to draw excess water from the fabric. Certain constructions can not be handled in this manner, neither can they be subjected to ordinary centrifuge extraction. A development that has answered this purpose, and which is not well known to the trade, is a new tensionless vacuum slot extractor. A perforated hollow roller is fitted around the slotted pipe and driven in such manner that suction extraction is accomplished without the usual tension for drawing material across the suction slots. This machine was developed by a well known finishing plant and has now been placed with one of the large machine manufacturers for distribution.

The Smith Drum "fountain" or "cascade" machine which embodies the spindle principle of the Buhlmann machine, represents one of the newer developments in skein dyeing equipment. Instead of yarn being moved through dye liquor, the liquor is pumped through the spindle which holds the yarn. This method is of particular advantage for the dyeing of rayon yarns, because the subsequent winding operation is simplified. Dye liquor in this machine, being pumped through the yarn on the spindle, causes a floating of yarn in this liquor, which then flows down the yarn to the dye box. From this it is continuously circulated. No part of the skein is submerged in the dye box liquor. The volume of liquor pumped through the yarn can be regulated so as to completely surround the yarn. This prevents yarn from coming in contact with air, and is extremely beneficial in vat color dyeing in that the danger of oxidizing vat dyestuffs is practically eliminated. Periodically the position of the yarn on the spindle is changed, without adversely affecting the winding qualities of the yarn.

In both Buhlmann and Smith Drum equipment, more hydrosulfite is required for the reduction of vat colors than in the old open dye box, in which yarn is suspended on sticks turned by hand. This added expense is easily offset by savings in time and labor, as well as in improved winding qualities of rayon yarn.

The use of vat colors has grown steadily in recent years. Two new methods which have opened a new era in the field of continuous application of vat colors to a vast variety of fabrics and constructions, are the Williams Unit and the Pad Steam Process. By the use of either it is possible to fill the fastness requirements of the trade, and at the same time retain the advantages of previously used methods of continuous dyeing, namely a high degree of production and uniformity of shade on long runs. No attempt at a comparison of these two methods will be made. The older "booster" box method has been practically out-moded by these newer methods.

In explanation of the Williams Machine method it is important to bear in mind that for many years the reduction of vat dyestuff to the soluble sodium leuco form which has affinity for textile fibers was supposed to require some minutes.

An exhaustive study of all available vat dyestuffs proved that other factors had a controlling influence on the speed of reduction to the sodium leuco compound and subsequent fixation on the fiber. With higher reduction temperatures, from 190-200° F., and increased quantities of caustic soda and sodium hydrosulfite, the time of reduction was reduced to a matter of seconds. The mechanical features of the Williams machine also contribute to the successful application of vat dyestuffs, as well as other dyestuffs.

After padding in a two or three roll pad, the material is dried, preferably in a hot flue type of dryer to avoid migration of pigment. Rayons, either spun or filament, as well as rayon blends, are not dried. Even cotton fabrics are occasionally not dried. In either case, the cloth is then conducted through the Williams unit at speeds of 45-90 yarns per minute. At 45 yards per minute cloth is in the Williams Unit for 15 seconds. For dark shades it is customary to use two Williams Units piped together for the reduction operation, doubling the time factor at these respective speeds. Various factors influence the speed of operation, depth of shade as well as construction of fabric. The unit is charged with caustic soda and sodium hydrosulfite, about 2 oz. and 1½ oz. respectively per gallon, and also a small amount of pad liquor. These starting concentrations are maintained throughout the run by feeding caustic soda solution and preferably dry hydrosulfite. The quantities of chemicals fed during the run are determined from periodical titrations of the liquor in the unit. Common salt, if necessary, is added to the unit at the start, as well as a small amount of pad liquor, he quantities depending upon the depth of shade and types of vat dyestuffs in use. Passage of the cloth through dye liquor confined within the ¼" to ½" between baffles and steam chamber creates a turbulence and provides the necessary diffusion of dyestuff. After passing through the Williams Unit the cloth is squeezed and finished by rinsing, oxidizing, soaping and again rinsing. Some plants find it satisfactory merely to rinse

(Concluded on Page P32)

Intersectional Contest—Third Prize Winner—

SOME PHASES OF HIGH TEMPERATURE DYEING*

PHILADELPHIA SECTION

Committee

O. B. Hager, *Chairman and Speaker.*
A. W. Etchells.
A. L. Lippert.
J. M. Fletcher.
S. G. Turnbull, Jr.
H. F. Clapham.
B. F. Faris.
J. A. Woodruff.
E. C. Dreby.
R. B. Stehle.
A. E. Felgendreger.
D. D. Gagliardi.
M. H. Klein.
H. L. Morgan.
T. J. Scanlon.
Thomas R. Foltz, Jr.
Percival Theel.

I. Introduction and Literature Survey

A GREAT many published accounts *(1)* of the influence of various temperatures on dyeings have related the different temperatures to (a) the properties of the dyes in solution, (b) the dyes in and on the textile fibers, and (c) the physical properties of the dyed fibers. In many cases, increasing temperatures from 200° F. to 212° F. were without practical harm to fiber properties while bringing about increases in rate of exhaustion, better penetration, higher tinctorial strength, and better levelness characteristics of the dyes. Since the rate of increase of the desirable features was frequently still large at the highest temperature of observation (212° F.), questions are raised as to how much additional gain is available at still higher temperatures. These have gone largely unanswered.

A literature search has revealed a few instances of active interest in the outcome of dyeings at temperatures above 212° F. Walter *(2)* has described a method of dyeing "wool and woolen materials and other nitrogenous textile materials and materials comprising wool or other nitrogenous textile materials, continuously, and in open form". This features a closed vessel having ingenuously constructed slits for entrance and exit of fabric so that within the vessel the cloth may be immersed in aqueous solutions maintained under sufficient pressure to permit temperatures as high as 295° F. The principal advantage cited by Walter for his process is speed, since satisfactory dyeings are said to be obtained at cloth speeds of more than twenty-five yards per minute. The material is in contact with the solution for a total immersion time of less than a minute. Skeuse *(3)* cites examples of vastly improved top chrome dyeings of nylon by steaming under pressure. His procedure, briefly, consists of the following steps: (a) dyeing the nylon by boiling in an acid bath containing the chrome color in the usual way, (b) immersing the dyed nylon fiber in an acid bath of bichromate, (c) steaming the dyed and chromated nylon "at a pressure at or above eight pounds above atmospheric pressure at a temperature of 235° F. or above" for about forty-five minutes, and (d) soaping, rinsing and drying the fabric. Royer and Stearns *(4)* have described "an apparatus for the treatment of a material with a liquid under controlled temperature and pressure conditions". The apparatus permits batch dyeings to be made with exceedingly short intervals of time required for heating up to the desired temperature and stopping the dyeing at the end of a prescribed time. Since the apparatus is closed, proper selection and design of the construction materials makes a dyeing at high pressures and temperatures readily accomplished. The apparatus, as described, is more of a laboratory research tool than a commercial dyeing machine, but the salient principles of its operation might very well be incorporated in a commercial design. Haller *(5)* concluded, from experiments designed to reveal the nature of the dyeing process, that by applying pressure to the liquid in which the dyed particles are heated, the dye is caused to coalesce into comparatively widely distributed aggregates easily visible with a microscope, thereby demonstrating dyed fabrics to be labile systems.

Contrariwise to the advantages of high temperature dyeings implied and expressed in the prior art given above, Albertini-Laufangroni *(6)* recommends carrying out of the dyeing of textile fibers *under reduced pressure.* The aim of his procedure, a batch procedure, is to avoid felting action of the fibers.

It is the objective of this paper to describe experiments designed to answer some of the many questions concerning high temperature dyeing, for which the literature does not provide information. The broad plan of this investigation reflects a belief that, in an unexplored field, it is more economical of effort to make a more or less cursory examination of a large number of factors than to concentrate intensively on a few.

II. Attainment of High Temperatures

Temperatures at and higher than 212° F. will hereafter be designated "high temperatures". They can be obtained by:—

A. Dyeing in non-aqueous media of high boiling point. This requires selection of the medium and dyes soluble in it. Although there is little doubt that many of the chemist's synthetic colored compounds are adaptable to such a technique, this approach appeared likely to be a long term one and therefore was abandoned.

B. Dyeing from aqueous baths having a high percentage of dissolved solid matter. Questions of the cost of maintaining such dyebaths would undoubtedly rule out this approach, nevertheless, the following experiments were made.

Wool was dyed with 6% Pontachrome Fast Red E Conc. (C. I. 652), with 8% of 28% acetic acid and 10% calcined Glauber's salt in the media shown in Table I at boiling points as given.

* Presented in Intersectional Contest, Augusta National Convention, October 23, 1948.

TABLE I. Dyebath Adjuvants for Producing High Boiling Points.

Per Cent conc. by wt.	Solute	Boiling Temperature (°F.)
60	Urea	219.2
60	Glycerine	219.2
50	Potassium Acetate	235.4
50	Glucose	221.0

All dyeings were poor, being much weaker than the normal due to failure of the dyes to exhaust, to coagulation, or destruction of the dyes in solution. Also, except in the case of urea, all "dyed" samples of wool were considerably harshened.

These preliminary experiments promised small chance of success for dye performance in addition to the high cost of the dyebath medium. Therefore, no further work was done on this approach.

C. "Pigment Padding" and setting in steam at high pressure. This procedure has been used with those dyes normally regarded as insoluble in water but solubilized by the combined action of chemicals and moisture at elevated temperatures. Using saturated steam at 236° F., this method was practiced for vat colors on cellulose acetate and cotton and sulfur colors on cotton as described later in this paper.

D. Dyeing from aqueous baths in closed systems at high temperatures. This approach appeared most likely to yield useful results and dyeing experiments on acetate, cotton, nylon, rayon, and wool were conducted by this method as also described later in this paper.

III. Selection of Dyebath Container Material and Design

The question of possible reactivity of the dyebath container material with the dye was considered and some exploratory experiments were made with closeable metal tubes (bombs). Two types of dyes and six tubes of different kinds of metal were used.

The dye solution was charged into the metal bombs which were closed and heated by immersion for one hour in oil heated to 266° F. At the end of the hour the bombs were raised from the oil and allowed to cool one hour. The dyebath was then transferred from the bomb to a stainless steel dye pot. A skein of scoured wool was introduced into each dyebath (1:30) and the temperature was raised to the boil (212° F.) and held for thirty minutes. The skeins were then removed from the dyebath, rinsed, dried, and examined.

A. 6% Pontachrome Fast Red E Conc. (C. I. 652).
6% Acetic Acid (28%).
10% Calcined Glauber's salt.

The materials of which the bombs were made and the results of the dyeings were as follows:

(a) Steel—color destroyed.
(b) Steel (glass lined)—color destroyed.
(c) Stainless Steel 18-8)—color destroyed.
(d) Stainless Steel (18-8) (glass lined) color destroyed .
(e) Stainless Steel KA_2SMO—color noticeably duller and yellower but approximately equal in depth to control (normal dyeing).
(f) Nickel—close to control—bluer.

B. 6% Chromacyl Bordeaux R. Conc. (Pr. 145).
6% Sulfuric acid (96%).
10% Calcined Glauber's salt.

(a) Steel—color completely destroyed.
(b) Steel (glass lined)—(Lost).
(c) Stainless Steel 18-8—bluer than control.
(d) Stainless Steel (18-8) glass lined)—close to control.
(e) Stainless Steel KA_2SMO — Trace bluer.
(f) Nickel — approximately one-third strength.

From the above experiments it was concluded that KA_2SMO metal reacted the least and glass lined 18-8 stainless steel is good if no condensate from the unlined cover can drop into the dye solution.

However, in view of the wide range of dyes to be used, it was decided to simplify the problem by adopting (except for cellulose acetate) a thick walled glass pressure tube with a metal outer casing to act as a shield in case of breakage. The design of the glass pressure tube and metal shield is illustrated in Figure 1.

IV. Dyebath Temperature and Agitation Control

The cellulose acetate and cotton dyebaths employed no mechanical agitation. Those on nylon, viscose rayon, and wool made use of arrangements to rotate the glass pressure tube in the metal shields in an end-over-end fashion about 12 to 14 r.p.m. In the case of nylon and wool, the tubes were continuously immersed in the liquid heating medium, whereas for viscose rayon the tubes were immersed for half of each rotation. Figure 2 is a photograph of the unit used for the wool studies.

Satisfactory thermostatic fluids were variously glycerine, diethylene glycol, and aqueous sodium formate solution.

The times required for the contents of the glass pressure tubes to reach the desired temperatures varied slightly with the different arrangements as shown in Table II.

The above times were not counted as part of the time of dyeing at any stated temperature; i.e., a dyeing stated to have taken place at 250° F. for 10 minutes for nylon would have been in the agitating machine and immersed in the thermostatic fluid a total time of 10 + 10 = 20 minutes.

V. Thermal Stability of Dyes

A selection of dyes found to be stable to high temperatures was made and used for all dyeings. Any differences in the quality of the dyeings from these dyes then could be attributed to the difference

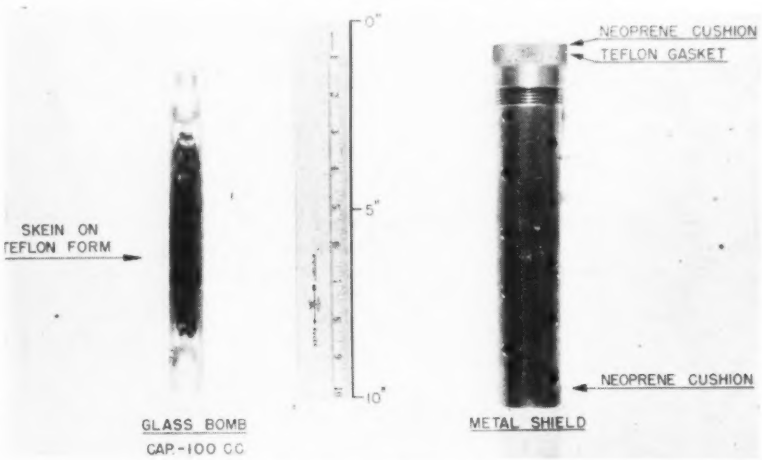


Figure 1. Glass Pressure Tube and Metal Shield.

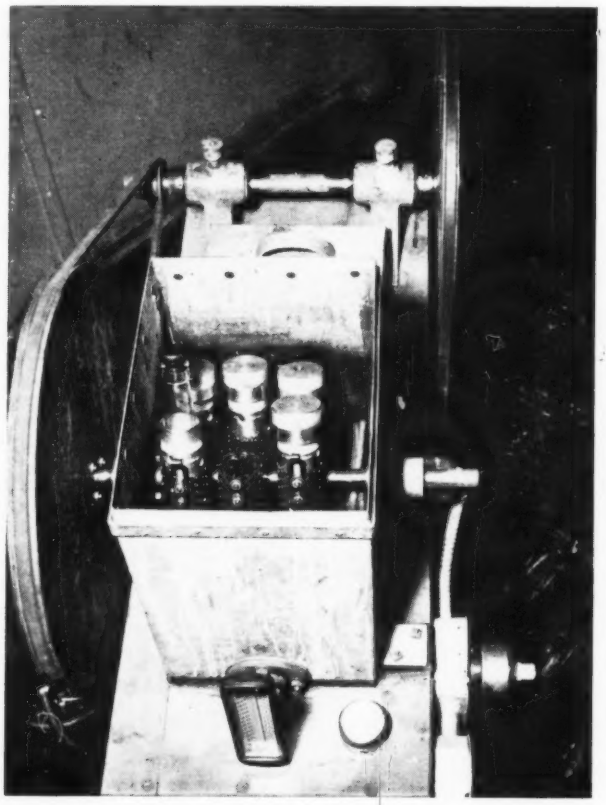


Figure 2. Wool Dyeing Machine

TABLE II. Times Required for Dyebaths to Reach Desired Temperatures.

Fiber	Temperature Range	Minutes
Cotton:	120° F. to 236° F.	8
Nylon:	80° F. to 212° F.	12
	80° F. to 248° F.	10
Rayon:	122° F. to 212° F.	15
	122° F. to 230° F.	25
	122° F. to 248° F.	15
Wool:	80° F. to 212° F.	4
	80° F. to 250° F.	8

TABLE III. Test Conditions for Thermal Stability of Dyestuffs.

Test	Dye Conc. (gm./l.)	Temp. (° F.)	Time (Min.)	pH	Dyebath Auxiliary Conc. (gm./l.)	Material
A	0.005	236	60	..	3	Acetic Acid, 28%
B	0.005	210	60	..	3	Acetic Acid, 28%
C	0.005	236	60	3.0	1.25	Acetic Acid, 28%
D	0.005	236	60	4.0	No Record	Acetic Acid, 28%
E	0.20	257	60	4.0	No Record	Acetic Acid, 28%
F	0.005	236	60	6.0	No Record	Acetic Acid, 28%
G	0.20	257	60	6.0	No Record	Acetic Acid, 28%
H	....	236	60	2.4	1.25	Formic Acid, 90%
I	0.005	236	60	1.2	1.25	Sulfuric Acid, 96%
J	0.20	257	60	2.0	No Record	Sulfuric Acid, 96%
K	10	120	30	..	(7.5	Sodium hydroxide)
					(7.5	Sodium hydrosulfite)
L	10	140	30	..	7.5	Same as K
M	10	236	10	..	7.5	Same as K
N	10	236	10	..	7.5	Same as K
O	10	180	30	..	10	Sodium sulfide
P	10	236	10	..	10	Sodium sulfide
Q	10	236	30	..	10	Sodium sulfide
R	0.005	236	60	..	0.5	Sodium oleate
S	0.0005	230	30	..	0.0	None
T	0.0005	248	30	..	0.0	None
U	0.005	210	60	..	0.0	None
V	0.005	236	60	..	0.0	None
W	10	180	30	..	0.0	None
X	10	236	10	..	0.0	None
Y	10	236	30	..	0.0	None

Oz. per Gallon = 0.1336 x Grams per Liter

between normal and high temperature and not to decomposition of the dyes.

A. Measurement. In principle all dyes were treated alike for the thermal stability measurements. Solutions or dyebaths of chosen concentrations were held for selected time intervals at a low (normal dyeing) temperature as a control and at the high temperature for comparison. The glass pressure vessels were used, and no textile material was present. Portions of the low and high temperature dyebaths were then allowed to cool, diluted to a convenient level for optical density readings, and both portions were measured for density at the wave length of minimum density for the control dyebath.

Since the optical density of colored solutions of dyes is generally linearly related to the concentration, the ratio of the density of the high temperature sample to the density of the low temperature sample, expressed as percentage, is taken to be a measure of the amount of dye left after the stability test.

A standard model General Electric recording spectrophotometer was available for these measurements.

Acid dyes, being soluble, required only simple dilution with water to bring the concentration to a conveniently low level, about 0.001%, for measurement.

Dispersed acetate dyes, in order to assure complete solubility, were diluted with acetone. Five milliliters of 0.05% dye dispersion (soap dispersed) was made up to 100 ml. with acetone for the measurement.

Vat dyes in soluble reduced form from the dyebaths were highly diluted with an oxidizing solution and the extremely fine, colloidally dispersed dyestuff was measured for optical density as though it were a soluble dye. Twenty-five milliliters of the dyebath from the simulated control and high temperature dyeings were oxidized with approximately 250 ml. of a solution containing

1.0 gram Hydrocarbon sulfonate (MP 189).

0.3 gram Sodium m-nitrobenzene sulfonate (Sitol).

100.0 ml. Acetic Acid (10%).

and this mixture was then made up to 500 ml. with water. A 10 ml. aliquot was then taken and made to 100 ml. to provide the final dilution from which the spectrophotometric measurements were made except for Sulfanthrene Yellow R Pat. (C. I. 1170) and Sulfanthrene Blue GR Pat. (C. I. 969) which required 5 ml. hydrogen peroxide in the final dilution to 100 ml.

Sulfur dyes were handled in principle as the vat dyes. It was sufficient to bring

TABLE IV. Dye Stabilities.

C.I. No.	Trade Name	Wave Length for Photometric Reading	% Dye Left	Temp. ° F.	Test Condition (Table III)
	Level-Dyeing Acid				
57	Pontacyl Carmine 6B Ex. Conc. 125%	530	72	236	I
57	Pontacyl Carmine 6B Ex. Conc. 125%	530	77	236	I
57	Pontacyl Carmine 6B Ex. Conc. 125%	530	105	236	D
57	Pontacyl Carmine 6B Ex. Conc. 125%	530	99	236	F
57	Pontacyl Carmine 6B Ex. Conc. 125%	530	105	257	E
639	Pontacyl Light Yellow GX	430	99	236	I
1054	DuPont Anthraquinone Blue BN	600	97	236	I
1054	DuPont Anthraquinone Blue BN	600	196	257	E
1078	DuPont Anthraquinone Green GN		100	257	G
1080	DuPont Anthraquinone Violet 3R	545	101	236	I
31	Pontacyl Carmine 2G Conc. 150%	530	97	236	I
252	DuPont Crocein Scarlet N Extra	510	98	236	I
696	Pontacyl Fast Violet 10B Conc. 175%	613	95	236	I
	Milling Acid				
430	Du Pont Milling Red SWB Conc. 125%	522	93	236	C
430	Du Pont Milling Red SWB Conc. 125%	522	88	257	G
642	Du Pont Milling Yellow 5G Conc.	430	99	236	C
642	Du Pont Milling Yellow 5G Conc.	430	99	257	G
152	DuPont Milling Orange R Conc.		67	257	G
833	Pontacyl Wool Blue BL Conc. 200%	575	94	236	C
	Premetallized				
Pr. 144	Chromacyl Blue GG Conc. 200%	590	95	236	I
Pr. 145	Chromacyl Bordeaux R	520	101	236	I
Pr. 145	Chromacyl Bordeaux R		104	257	J
Pr. 146	Chromacyl Orange R	480	99	236	I
	Chrome				
202	Pontachrome Blue Black RM		48	257	G
343	Pontachrome Fast Yellow R Conc.	430	50, 54	236	C
343	Pontachrome Fast Yellow R Conc.	430	47, 58	236	A
343	Pontachrome Fast Yellow R Conc.	430	62	210	B
343	Pontachrome Fast Yellow R Conc.	430	99, 108	236	V
343	Pontachrome Fast Yellow R Conc.	430	95, 101	210	U
652	Pontachrome Fast Red E Conc.	470	61, 69	236	C
652	Pontachrome Fast Red E Conc.	470	80	236	A
652	Pontachrome Fast Red E Conc.	470	96	210	B
652	Pontachrome Fast Red E Conc.	470	21	236	V
652	Pontachrome Fast Red E Conc.	470	54	210	U
652	Pontachrome Fast Red E Conc.	470	5	257	G
1085	DuPont Alizarine Blue Black B	543	101	236	C
1085	DuPont Alizarine Blue Black B	543	98	236	D
1085	DuPont Alizarine Blue Black B	543	99	236	F
1085	DuPont Alizarine Blue Black B	543	94	257	G
219	Pontachrome Flavine A Conc. 125%	430	98, 99	236	C
219	Pontachrome Flavine A Conc. 125%	430	100, 99	236	V
1034	Du Pont Alizarine Red S Conc.	520	112, 100	236	C
1034	Du Pont Alizarine Red S Conc.	520	101, 113	236	V
1034	Du Pont Alizarine Red S Conc.	520	104	257	G
216	Pontachrome Red B	495	102, 97	236	C
216	Pontachrome Red B	495	98, 98	236	V
	Direct				
814	Pontamine Fast Yellow BBL Conc. 125%	430	90	236	H
814	Pontamine Fast Yellow BBL Conc. 125%	430	108	236	Y
814	Pontamine Fast Yellow BBL Conc. 125%	430	92	236	X
814	Pontamine Fast Yellow BBL Conc. 125%	430	100	236	W
278	Pontamine Fast Red 8BL Conc. 125%	510	101	236	H
278	Pontamine Fast Red 8BL Conc. 125%	510	100	236	Y
278	Pontamine Fast Red 8BL Conc. 125%	510	99	236	X
278	Pontamine Fast Red 8BL Conc. 125%	510	100	236	W
278	Pontamine Fast Red 8BL Conc. 125%	516	95	230	S
518	Pontamine Sky Blue 6BX Conc. 150%	617	103	236	H
518	Pontamine Sky Blue 6BX Conc. 150%	617	103	236	U
518	Pontamine Sky Blue 6BX Conc. 150%	617	101	236	T
518	Pontamine Sky Blue 6BX Conc. 150%	617	100	236	S
518	Pontamine Sky Blue 6BX Conc. 150%	636	103	230	S
518	Pontamine Sky Blue 6BX Conc. 150%	636	101	248	T
—	Pontamine Fast Orange 2GL	430	92	236	H
419	Pontamine Fast Red FCB Conc. 150%	498	95	236	H
583	Pontamine Green S Extra Conc. 125%	597	94, 88	236	H
814	Pontamine Fast Yellow NNLK	400	105	230	S
	Acetate				
Pr.	Acetamine Yellow N	430	102	236	R
Pr. 244	Acetamine Scarlet B	485	101	236	R
Pr. 288	Celanthrene Brilliant Bue FFS Conc. 200%	594	94, 98 95, 96	236 236	R R
	Sulfur				
978	Sulfogene Carbon HRCF Grains		100	180	O
978	Sulfogene Carbon HRCF Grains		95	236	P
978	Sulfogene Carbon HRCF Grains		97	236	Q
—	Sulfogene Yellow CF		100	180	O
—	Sulfogene Yellow CF		94	236	P
—	Sulfogene Yellow CF		97	236	Q
949	Sulfogene Golden Brown RCF		100	180	O
949	Sulfogene Golden Brown RCF		104	236	P
949	Sulfogene Golden Brown RCF		105	236	Q
1012	Sulfogene Bordeaux CF Conc. 300%		100	180	O
1012	Sulfogene Bordeaux CF Conc. 300%		95	236	P
1012	Sulfogene Bordeaux CF Conc. 300%		94	236	Q
959	Sulfogene Navy Blue GL Ex. Conc.		100	180	O
959	Sulfogene Navy Blue GL Ex. Conc.		97	236	P
959	Sulfogene Navy Blue GL Ex. Conc.		99	236	Q

about their oxidation by the action of cold water. Twenty-five milliliters of the dyebaths were made up to 500 ml. and a 10 ml. aliquot of this was further diluted to 100 ml. with cold water for the photometric reading.

Dyebath Preparation. The various fibers and various classes of dyestuffs made it desirable to examine some of the dyes at different concentration levels and in the presence of different dyebath auxiliaries as given in Table III. The procedure in every case was to hold 80 ml. of the dyebath in the glass pressure tube at the designated temperatures and times given in Tables III and IV, allow to cool, and then dilute a carefully measured aliquot for the photometric reading as already described.

The vat dyes, as a class, showed the least thermal stability under the conditions imposed on them. Reduction of the amount of alkali and reducing agent may have permitted these dyes to have made a better showing. Even so, three of the eight dyes tested showed useful color stability.

Among the other classes of dyestuffs, the proportion showing satisfactory stability is high but individual members among the acid dyes were heat sensitive.

VI. High Temperature Dyeing

GENERAL.—Because of the wide variety of conditions normally required by the varying natures of the fibers and of the several classes of dyestuffs, it was considered desirable for these particular studies not to impose uniform conditions of time, temperature, agitation (or circulation) of the dyebaths. Consequently, in the following treatment of the experiments, each fiber will be discussed separately. The cellulosic fibers, cotton and rayon, are discussed first, the man-made fibers, rayon, acetate and nylon next, and finally the nitrogenous fibers nylon and wool.

Cotton

1.—EXPERIMENTAL COTTON MATERIAL. — Singed, desized, scoured, bleached and mercerized print cloth, 80 x 80 count, 4 yards per pound, 40 inches wide, was used for all dyeings. After conditioning at 70° F. and 65% relative humidity, 8 gram pieces were cut out.

2.—FIBER STABILITY AT HIGH TEMPERATURES.—There was reason to believe cotton would withstand approximately the same temperatures and alkalinity conditions it normally meets in kier boiling, and therefore no tests of fiber stability were made.

3.—GENERAL DYEING PROCEDURE.—Dyeings were carried out in the glass pressure tubes within metal shields

TABLE IV. Dye Stabilities (Continued)

C.I. No.	Trade Name	% Dye Left	Temp. ° F.	Test Condition (Table III)
	Vat			
1118	Ponsol Yellow G Dbl. Pst.	100	120	K
1118	Ponsol Yellow G Dbl. Pst.	70	236	M
1118	Ponsol Yellow G Dbl. Pst.	70	236	N
1170	Sulfanthrene Yellow R Supra	100	120	K
1170	Sulfanthrene Yellow R Supra	106	236	M
1170	Sulfanthrene Yellow R Supra	106	236	N
1114	Ponsol Blue BCS Dbl. Pst.	100	120	K
1114	Ponsol Blue BCS Dbl. Pst.	42	236	M
1114	Ponsol Blue BCS Dbl. Pst.	42	236	N
Pr. 124	Ponsol Red G2B Dbl. Pst.	100	120	K
Pr. 124	Ponsol Red G2B Dbl. Pst.	23	236	M
Pr. 124	Ponsol Red G2B Dbl. Pst.	10	236	N
Pr. 109	Sulfanthrene Pink FF Pst.	100	120	K
Pr. 109	Sulfanthrene Pink FF Pst.	48	236	M
Pr. 109	Sulfanthrene Pink FF Pst.	73	236	N
969	Sulfanthrene Blue GR Pst.	100	120	K
969	Sulfanthrene Blue GR Pst.	98	236	M
969	Sulfanthrene Blue GR Pst.	102	236	N
1151	Ponsol Brown AR Dbl. Pst.	100	120	K
1151	Ponsol Brown AR Dbl. Pst.	77	236	M
1151	Ponsol Brown AR Dbl. Pst.	73	236	N
1101	Ponsol Jade Green Supra	100	120	K
1101	Ponsol Jade Green Supra	103	236	M
1101	Ponsol Jade Green Supra	110	236	N

TABLE V. Relative Tinctorial Strength of High Temperature Dyeings of Vat, Sulfur, and Direct Dyes on Cotton.

C.I. No.	Trade Name	Temp. ° F.	Strength	Shade
	Vat			
1118	Ponsol Yellow G Dbl. Pst.	140	5	.....
1118	Ponsol Yellow G Dbl. Pst.	236	3	4 Green
1170	Sulfanthrene Yellow R Supra	140	5	.....
1170	Sulfanthrene Yellow R Supra	236	3-2	4 Green
Pr. 124	Ponsol Red G2B Dbl. Pst.	140	5	.....
Pr. 124	Ponsol Red G2B Dbl. Pst.	236	2-1	3 Dull
Pr. 109	Sulfanthrene Pink FF Pst.	160	5	.....
Pr. 109	Sulfanthrene Pink FF Pst.	236	2-1	3 Dull
969	Sulfanthrene Blue GR Pst.	140	5	.....
969	Sulfanthrene Blue GR Pst.	236	4-3	.....
1114	Ponsol Bue BCS Dbl. Pst.	120	5	.....
1114	Ponsol Bue BCS Dbl. Pst.	236	1	1 Dull
1151	Ponsol Brown AR Dbl. Pst.	140	5	.....
1151	Ponsol Brown AR Dbl. Pst.	236	3-2	Dull
1101	Ponsol Jade Green Supra Dbl. Pst. (Pat.)	140	5	.....
1101	Ponsol Jade Green Supra Dbl. Pst. (Pat.)	236	5	5-4 Bright
	Sulfur			
978	Sulfogene Carbon HRCF Grains	180	5	Not Determined
978	Sulfogene Carbon HRCF Grains	236	7-8	Not Determined
—	Sulfogene Yellow CF	180	5	Not Determined
—	Sulfogene Yellow CF	236	7	Not Determined
949	Sulfogene Golden Brown RCF	180	5	Not Determined
949	Sulfogene Golden Brown RCF	236	7	Not Determined
1012	Sulfogene Bordeaux CF Conc. 300%	180	5	Not Determined
1012	Sulfogene Bordeaux CF Conc. 300%	236	5	Not Determined
959	Sulfogene Navy Blue GL Ex. Conc.	180	5	Not Determined
959	Sulfogene Navy Blue GL Ex. Conc.	236	5-6	Not Determined
	Direct			
814	Pontamine Fast Yellow BBL Conc. 125%	180	5	Not Determined
814	Pontamine Fast Yellow BBL Conc. 125%	236	5	Not Determined
278	Pontamine Fast Red 8BL Conc.	180	5	Not Determined
278	Pontamine Fast Red 8BL Conc.	236	7	Not Determined
518	Pontamine Sky Blue 6BX Conc. 150%	180	5	Not Determined
518	Pontamine Sky Blue 6BX Conc. 150%		5	Not Determined

Table VI. Cotton Dyeings Selected for Transfer Study.

C.I. No.	Dyestuff, Trade Name	S.D.C. Classification (9)	% Dye
326	Pontamine Fast Orange S Conc. 175%	C	1.0
502	Pontamine Blue AX Conc.	C	1.0
814	Pontamine Fast Yellow NNL Conc. 175%	C	0.5
Pr-73	Pontamine Fast Orange ERL	B	1.0
326	Pontamine Fast Scarlet 4BA	B	1.0
—	Pontamine Fast Green GL	B	2.0

(Figure 1). High temperatures were obtained by complete immersion in sodium formate solution of sufficient concentration to boil at 236° F. There was no mechanical motion of the tubes to aid agitation of the dyebath.

The dye was padded on the cloth and then dried. The dried cloth was then inserted into the glass pressure tube already containing the appropriate solution for the dye involved adjusted to 120° F. Control dyeings were held at 120° F., 140° F., or 180° F., depending on the dyes, and the high temperature dyeings were plunged into the 236° F. bath as soon as the glass pressure tubes were closed by the shields.

4.—HIGH TEMPERATURE COTTON DYEINGS.—*(a) The conditions for dyeing the several dye types follow:*

Vat dyes:

Thirty gm./1. pigment padded at 120° F., dried and reduced in glass pressure tube with 7.5 gm./.1. caustic soda and 7 gm./1. sodium hydrosulfite at 1:10.

A. Control—Standard reduction temperature for 30 minutes.

B. Held at 236° F. for 30 minutes.

Sulfur Dyes:

Thirty gm./1. of dye solubilized with 30 gm./1. sodium sulfide, padded and dried, then treated in glass pressure tube at 1:10 with 7.5 gm./1. sodium sulfide.

A. Control—Held at 180° F. for 30 minutes.

B. Held at 236° F. for 30 minutes.

Direct Dyes:

Seven and one-half gm./1. of dye padded and dried, then treated with water at 1:10 in the glass pressure tube.

A. Control—Held at 180° F. for 30 minutes.

B. Held at 236° F. for 30 minutes.

Table V gives the visual ratings of the dyeings for tinctorial strength and shade. The strength of each control was arbitrarily designated 5 and weaker strengths were designated 4, 3, 2, 1 as they became progressively weaker and 6, 7, 8, etc., as they became stronger. Shading is given in descriptive terms with strength of shading designated by 5, 4, 3, 2, 1 as it became more prominent, that is, 5 means no noticeable difference and 1 is very different.

Among the vat dyeings, C.I. 1101 (Jade Green) was the only one retaining tinctorial strength equal to the control. The others lost considerable strength. The sulfur dyeings, in contrast to the vat dyeings, showed in most cases a slight improvement in strength at high temperatures. All of the three direct dyeings at high temperature showed tinctorial strength equal to the control except that from C.I. 278 (Fast Red 8BL) which was slightly stronger. It must be borne in mind, however, that this improvement may have been achieved also at 200° F.-212° F.

(b) Dye Transfer at High Temperatures

The experiments were carried out by exposing, with agitation, a previously dyed sample and an undyed sample in the apparatus shown in Figure 1 for (a)

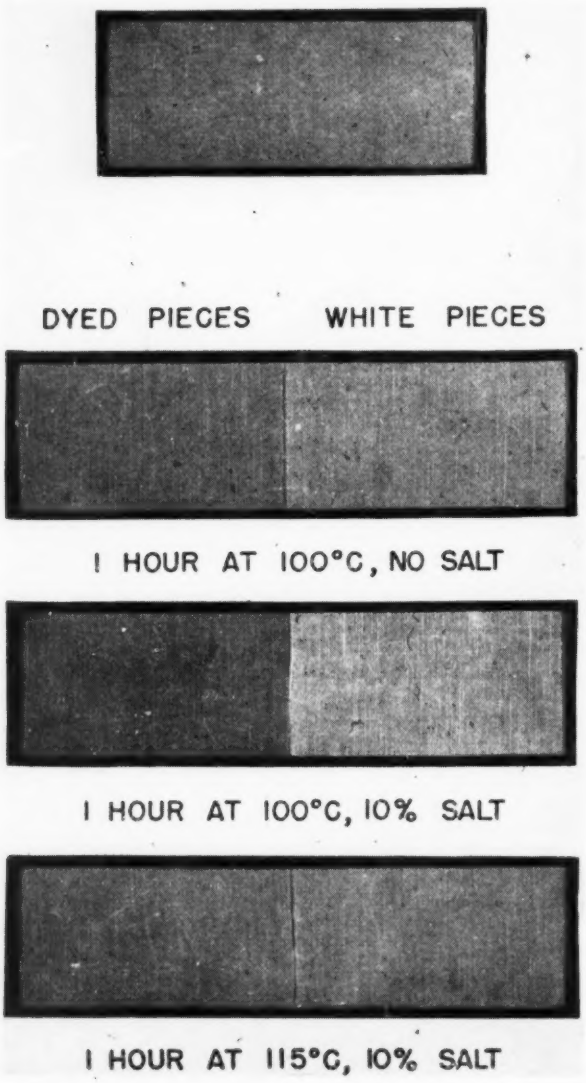


Figure 3. Transfer of Direct Colors: 1% Pontamine Fast Orange S Conc. 175% (C. I. 326).

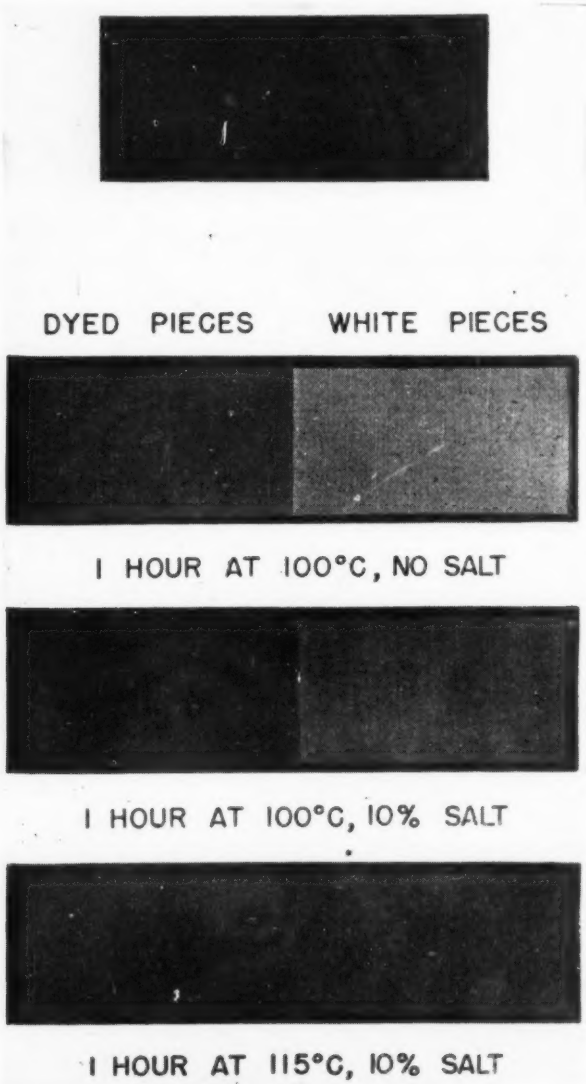


Figure 4. Transfer of Direct Colors: 2% Pontamine Fast Green GL.

one hour at 212° F. using no salt and (b) one hour at 212° F. with 10% common salt, and (c) one hour at 236° F. using 10% salt. The dyeing selected for the transfer studies are given in Table VI.

Figures 3 and 4 typically illustrate the practically complete color equalization at 236° F. for one hour with 10% salt for all dyes in both classes. This is in contrast to from 10% to 50% transfer, depending on the dyestuff, at 212° F. for one hour without salt. It was noted that the low temperature bath without salt contained a greater concentration of dyestuff.

(c) *Fastness Characteristics of High Temperature Dyeings.*

For the vat dyed cotton samples, the following fastness tests were made:

Light
Washing, AATCC #3
Chlorine (0.3% Available)
Crocking—wet
Crocking—dry

C.I. 1101 (Jade Gren), Pr. 124 (Red G2B) and C.I. 969 (Blue GR) showed no loss of lightfastness whereas the remainder of vat dyes were rated one point inferior relative to the standard dyeing.

Sulfur dyeings were submitted to all the fastness tests to which the vats were subjected except chlorine fastness. No differences in ratings occurred between standard and high temperature dyeings for any of the dyes or any of the fastness tests.

Direct dyeings were subjected to the following tests:

Light
Washing, AATCC #2
Crocking—dry

C. I. 814 (Fast Yellow) lost one point of light fastness for the high temperature dyeing and C. I. 518 (Sky Blue) lost one point of wash fastness for the high temperature dyeing.

It may be concluded that batch dyeing at 236° F. for 30 minutes did not effect any improvements in fastness characteristics of cotton dyed with certain vat, sulfur and direct dyes. In certain cases small decreases in fastness were noted.

5.—SUMMARY AND CONCLUSION.—The most important advantage revealed for dyeing at high temperatures for 30 minutes by these experiments lies in bet-

TABLE VII. Breaking Strength of Rayon Fabric Subjected to High Temperature Water Unadjusted for Shrinkage.

Water Temp. ° F.	Exposure Time (Minutes) 0 W	0 R[a]	0 F	0 R[a]	5 W	5 R[a]	5 F	5 R[a]	30 W	30 R[a]	30 F	30 R[a]
212 ..	49.8	15.5	29.0	2.5	48.6	8.5	28.0	4.5	49.8	5.0	27.3	3.0
230 ..	53.2	10.5	29.7	3.0	53.0	8.5	28.6	3.0	55.0	8.5	29.8	4.5
248 ..	53.4	8.0	28.7	7.5	56.6	13.0	31.2	9.0	53.7	10.0	29.5	5.0
266 ..	57.2	3.5	31.5	5.5	52.3	3.0	30.5	4.0	56.7	47.0	29.1	8.0
D.C.[b]	52.5	1.0	29.3	6.5								
W.C.[c]	51.8	3.7	30.0	1.0								

Notes: a—Range (difference between high and low observation)
b—Dry control; Fabric as received.
c—Wet control; Fabric wet with water at room temperature.

TABLE VIII. Action of Alkalinity for Fifteen Minutes at High Temperatures on Tensile Properties of Viscose Yarn.

Temp. ° F.	NaOH Conc. %	Breaking Strength Grams	Breaking Strength R[a]	Elongation Grams	Elongation R[a]
212	0.00	340	62	20.9	5.3
212	0.10	336	21	19.9	5.8
212	0.25	333	53	21.0	4.8
212	0.50	325	48	20.9	5.0
212	1.00	353	18	22.9	1.7
230	0.00	334	68	19.8	6.0
230	0.10	355	28	21.8	3.2
230	0.25	320	63	19.9	4.9
230	0.50	328	48	20.8	3.1
230	1.00	334	42	21.9	3.4
248	0.00	344	26	21.1	1.7
248	0.10	342	43	20.7	3.3
248	0.25	339	25	22.5	1.3
248	0.50	341	21	22.1	2.0
248	1.00	287	38	19.6	5.9
266	0.00	347	23	22.5	3.5
266	0.10	334	42	21.4	1.3
266	0.25	339	25	22.5	1.3
266	0.50	341	21	22.1	2.0
266	1.00	287	38	19.6	5.9
Control		355	22	20.6	3.2

Note: a—Range (difference between highest and lowest observations).

ter levelling of certain fast striking direct dyes. This advantage is generally offset, however, by availability of a large number of excellently performing dyes at conventional dyeing temperatures.

In the case of sulfur dyes, high temperatures increased the strength of the dyeings slightly, though perhaps not enough to be of great practical value. This tendency suggests that good sulfur dyeings might be obtained in very much shorter exposure times.

In the case of vat dyes, all changes attributable to high temperatures were in undesirable directions. Many of the dyes themselves are not stable in the reduced form at 236° F. for 30 minutes in the presence of the usual amounts of auxiliary chemicals.

Viscose Rayon

1.—EXPERIMENTAL RAYON MATERIAL.—Dyeings were made on three distinctly different types of material, namely:

(a) Spun rayon fabric. Challis construction, 82 x 62, 26's warp and 40's filling, 3.38 oz./sq. yd. Desized, scoured, and dried.

(b) Tire cord, high twist Avisco, 1650 denier, 980 filament.

(c) Never-dried viscose cubes (Avcolite) *(8)*.

In addition to the above, fiber stability tests were made with 150 denier, 40 filament, low twist, Avisco Bright regular viscose rayon yarn.

2.—FIBER STABILITY AT HIGH TEMPERATURES.—Tests were made on the possible effect of high temperature dyebaths on the tensile properties of a spun rayon fabric and bright filament yarn, 150 denier, 40 filament.

(a) *Stability to Water*

Five-gram samples of fabric were placed in the glass pressure tube (Figure 1) containing 80 ml. of distilled water adjusted to 122° F. The sealed and shielded tube was then immediately placed in the glycerine bath adjusted to the desired temperature and agitation by rotation started.

The breaking strength of the fabric, unadjusted for shrinkage, was determined by the ravelled strip method and the results, in pounds, are given in Table VII, each value being the average of six or more breaks.

Adjustments for shrinkage are small, being 92.3% and 94.1%, for warp and filling respectively, of the values for treatments at 212° F. and higher. To compare strictly with the control values adjustments of the values in Table VII must be made. Shrinkage was practically completed at 212° F.

Table VII shows that water at high temperatures is without deleterious effect on the breaking strength of the fabric selected for this work.

(b) Stability to Alkaline Solutions

Because dyebaths for sulfur and vat dyes often used on rayon are appreciably alkaline, the possible interactions of time, temperature and alkalinity on the tensile properties of rayon were thought important to evaluate. To do this, 3-gram skeins of Avisco bright filament rayon yarn, 150 denier, 40 filament, were entered into solutions of sodium hydroxide of selected strengths at room temperature, placed in an autoclave (no agitation) and raised to the treating temperature in approximately 5 to 8 minutes. They were maintained at the treating temperature for 15 minutes after which the autoclave pressure was reduced, the skeins removed, rinsed free of alkali, centrifugally extracted, and dried at normal room temperature.

Breaking strengths and elongations of the treated yarn conditioned to 60% relative humidity were made on a Scott IP2 Tester using 10" specimen gauge length. The values in Table VIII are the averages of ten breaks on each skein.

3.—GENERAL DYEING PROCEDURE AND APPARATUS.—The glass pressure tube with shield already described (Figure 1) was used in the specially made rotating device differing from that shown in Figure 2 by holding the tubes immersed in the heating liquid for only one-half of each full rotation. A cover with walls of thick insulating material delayed cooling of the tubes during the half cycle they were not immersed in the heating fluid.

The various fiber baths were preheated to 12° F. before entering the fiber material. Immediately after the fiber material was entered, the tubes were closed and placed in the rotating device with the glycerine bath already adjusted to the desired temperature.

One per cent dye on fiber weight was used for all dyeings. A 1:16 ratio was used for the spun rayon fabric and a 1:30 ratio for the high twist tire yarn and the never-dried viscose cubes.

Only the direct colors have been studied on rayon.

4.—HIGH TEMPERATURE RAYON DYEING.—*(a) Tinctorial Strength.*

A series of dyeings were made on spun rayon fabric with the following dyes:

TABLE IX. Diffusion Penetration of Direct Dyes Into Viscose Cubes at Various High Temperatures.

	Temperature 212° F. 15 Min.	212° F. 45 Min.	230° F. 5 Min.	230° F. 35 Min.	248° F. 15 Min.	248° F. 45 Min.
Brilliant Benzo Blue 6BA .....C.I. 518	2—	3—	..	4—	3	5—
Chlorantine Blue 3GLL.....——	1—	1.5	..	2	2—	3—
Diphenyl Fast Red B.....C.I. 419	4—	4+	..	..	5+	6.5
Diphenyl Fast Red 7BL.....C.I. 278	5.5	7.5	..	..	7.5	9.+
Average (a)	2.9	4.0	..	..	4.4	5.8

Note: (a) ¼ point subtracted for negative values and ¼ point added for positive values in obtaining the averages.

TABLE X. Dyes Used for Rayon Transfer Tests.

C. I. No.	Dyestuffs	S.D.C. Classification (9)
518	Benzo Brilliant Blue 6BA.....	B
—	Chlorantine Fast Blue 3GLL.....	B
419	Diphenyl Fast Red B.....	C
—	Azoanthrene Brilliant Blue G.....	C

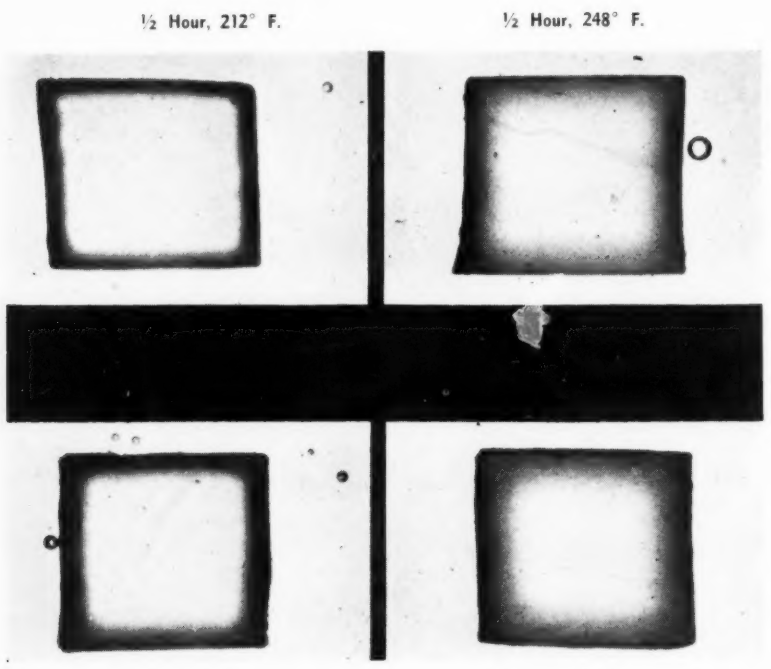


Figure 5. Diphenyl Fast Red BC (C. I. 419)

Brilliant Benzo Blue 6BA C.I. 518
Chlorantine Fast Brown BRL Pr. 47
Diphenyl Fast Red 7BL 278
Pontamine Fast Yellow NNLK 814

One series of dyeings consisting of two sets was made at 212° F. for 15 minutes, one set without salt, and the second set with 10% common salt. A second series of dyeings consisting of two sets was made at 230° F. for 5 minutes, one set without salt, and the second set with 10% common salt. Salt, when used, was added at the start of the dyeing.

Visual observations of the dyeings showed no apparent differences attributable to temperature in levelness, penetration, or depth of shade. All of these characteristics were quite satisfactory for the 212° F. dyeings.

It was thought that an advantage for high temperatures might show in better penetration on large, highly twisted yarns. Therefore, a series of dyeings were made on 1650 denier, 980 filament, tire cord, using the following dyes:

Brilliant Benzo Blue 6BA C.I. 518
Chlorantine Blue 3GLL ——
Diphenyl Fast Red 7BL C.I. 278

One set of dyeings were made at 212° F. for 15 minutes without salt, and another with 5% common salt. A second set of dyeings was made at 248° F. for 15 minutes without salt, and another set with 5% common salt. Salt, when used, was added at the start of the dyeing.

Again, visual examination showed that the higher temperature produced no better penetration of the dye, although in this case penetration was not complete at either temperature.

Depth of shade was less at 248° F. than at 212° F. for C.I. 518 and Chlorantine Blue 3GLL, the difference being less for the latter color. No difference in depth of shade was noticeable in dyeings of C.I. 278 at the two temperatures.

(b) Diffusion Penetration at High Temperatures

Using a technique *(8)* previously shown useful for measuring the apparent rate of diffusion of dyes into viscose, 2.5 grams of never-dried viscose (Avcolite) were dyed with the following dyes:

Brilliant Benzo Blue 6BA C.I. 518
Chlorantine Blue 3GLL ——
Diphenyl Fast Red B 419
Diphenyl Fast Red 7BL 278

Diffusion penetration was measured in sixty-fourths of an inch with a microscope using a magnification of 7.5 times. The results are given in Table IX.

The results in Table IX show that the diffusion penetration of all the direct dyes examined increases as the temperature increases. This is illustrated in Figure 5.

The dyeing experiments in the apparatus available for high temperature dyeing did not show the improvements suggested as being possible by the increased diffusion penetration measurements.

In explanation, it may be said that if a circulation of dye solution could be established which would carry the dye particles into intimate contact with all parts of the fibers and filaments in a fabric or yarn, then at the higher temperatures there would be less time required for complete penetration of the individual fibers and filaments. Without the circulation, this increased penetration will be seen only on the surface fibers in contact with the dye liquor.

Under conditions of high speed continuous application of dyes, these experiments on diffusion penetration suggest that even shorter times of dyeing may be obtainable at higher temperatures.

(c) Dye Transfer at High Temperatures.

Transfer studies were made using the spun rayon fabric dyed in 1% shades with the dyes shown in Table X.

A piece of each of the dyed fabrics together with a piece of undyed fabric of

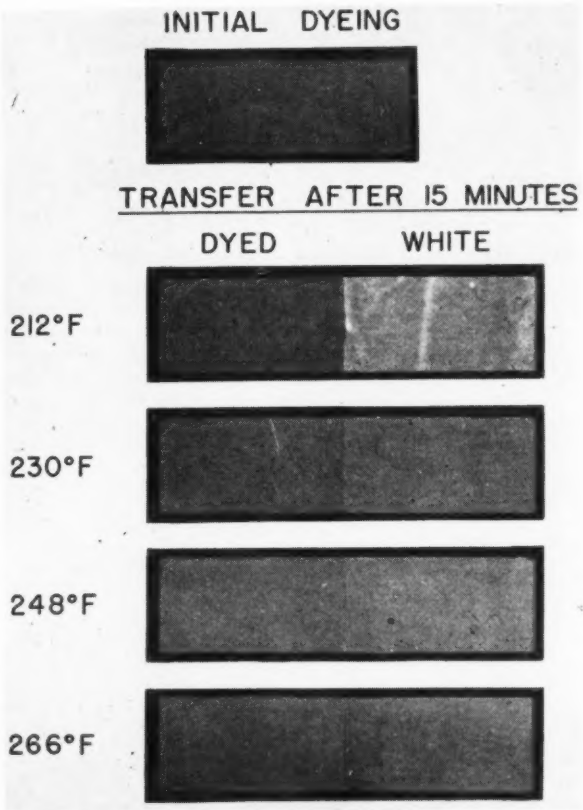


Figure 6. Dye Transfer, Spun Viscose Rayon: 1% Diphenyl Fast Red B (C. I. 419).

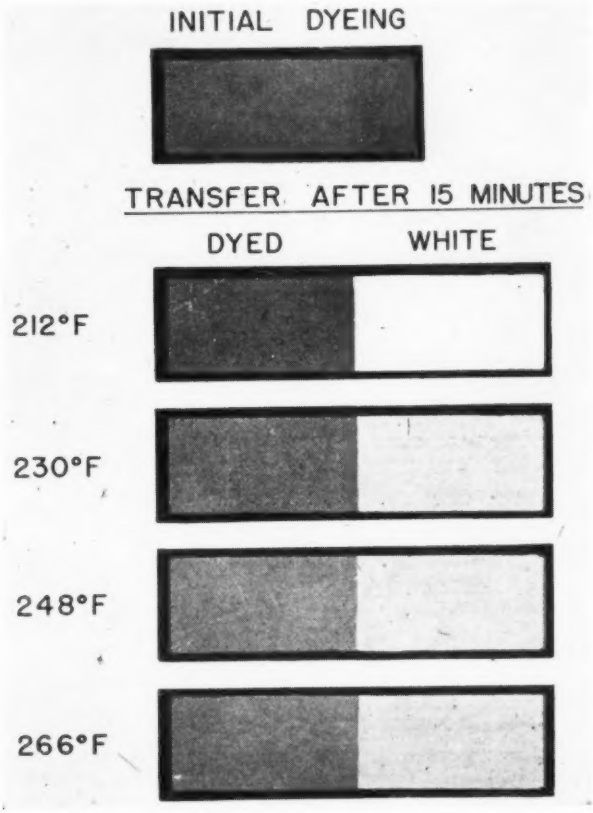


Figure 7. Dye Transfer, Spun Viscose Rayon: 1% Azoanthrene Brilliant Blue G.

TABLE XI. Dye Transfer of Direct Dyes on Rayon at Various Transfer Temperature.

C. I. No.	Dyestuff	Temp. ° F.	Transfer % Undyed	Dyed
518	Benzo Brilliant Blue 6BA	212	40	60
		230	50	50
		248	50	50
		266	50	50
—	Chlorantine Fast Blue 3GLL	212	25	75
		230	35	65
		248	40	60
		266	45	55
419	Diphenyl Fast Red B	212	25	75
		230	40	60
		248	45	55
		266	50	50
—	Azoapthrene Brilliant Blue G	212	10	90
		230	15	85
		248	25	75
		266	30	70

equal weight was placed in the glass pressure tube (Figure 1) containing a solution of common salt in an amount equal to 5% of the total weight of fabrics and run for 15 minutes after reaching the desired temperature. Sets of transfers were made at 212° F., 230° F., 248° F., and 266° F.

Classification of the dyes by the diffusion penetration technique described in the preceding section, differentiates further than does the S. D. C. classification, in that the Benzo Brilliant Blue 6BA and Diphenyl Fast Red B have a moderate diffusion penetration, and Chlorantine Fast Blue 3GLL and Azoanthrene Brilliant Blue G shows a very low diffusion penetration. The "B" and "C" dyes do no level readily, even at high (up to 212° F.) temperatures. The "B" dyes do not exhaust well except on addition of salt to the dyebath. The "C" dyes exhaust readily without salt when dyed at high temperatures near 212° F., although exhaustion is further increased by using salt.

The observations made on the dye transfers are given in Table XI in which the visual estimation of the transfer is expressed as the percentage of total dye, after transfer, on the dyed piece and the percentage on the undyed piece.

Figures 6 and 7 illustrated the leveling effect of high temperature as given in Table XI for Diphenyl Fast Red B and Azoanthrene Brilliant Blue G.

5.—SUMMARY AND CONCLUSION.—The basic advantages for high temperature dyeing of viscose rayon with direct dyes, as indicated by these experiments, are the following:

1. Increased rate of diffusion penetration.

2. Better transfer of dyes.

These advantages are not realized in slow batch methods but they should make it possible for the dyer to increase the speed of dyeing in continuous systems and achieve more uniform shades than is now possible at 212° F. with the class of dyes

TABLE XII. Breaking Strengths of Cellulose Acetate Fabrics Subjected to High Temperatures.

Treatment	Exp. Time (Min.)	Test Fabric A Condition #1 Std. Dev.[1] (Lbs.)	Test Fabric A Condition #1 Av. Break Str.[2] (Lbs.)	Test Fabric A Condition #1 % Loss	Test Fabric B Condition #1 Std. Dev.[1] (Lbs.)	Test Fabric B Condition #1 Av. Break Str.[2] (Lbs.)	Test Fabric B Condition #1 % Loss	Test Fabric B Condition #2 Std. Dev.[1] (Lbs.)	Test Fabric B Condition #2 Av. Break Str.[2] (Lbs.)	Test Fabric B Condition #2 % Loss
F	0	1.2	49	..	0.2	67	..	0.2	67	..
F	3	5.6	29	46	1.0	31	53	6.3	47	29
F	5	3.2	27	45	1.0	36	46	1.7	36	46
F	10	0.9	25	49	2.7	32	52	2.0	36	46
F	20	2.6	28	43	2.7	31	53	0.0	37	44
F	30	1.7	25	49	1.0	32	52	1.7	36	46
W	0	7.4	78	..	2.6	45	..	2.6	45	..
W	3	2.6	44	43	1.0	19	57	1.2	26	42
W	5	2.2	37	53	0.2	21	53	2.0	25	44
W	10	1.5	39	50	1.0	19	57	0.0	25	44
W	20	1.5	41	48	1.4	19	57	2.2	22	51
W	30	1.5	38	51	1.0	19	57	1.7	24	46

1. Standard Deviation $= \left(\frac{\Sigma(X-\bar{X})^2}{N-1}\right)^{\frac{1}{2}} = \left(\frac{\Sigma d^2}{N-1}\right)^{\frac{1}{2}}$
2. Average Breaking Strength $\bar{X}$ of three specimens (N=3).

difficult to level. These advantages can be obtained when using direct dyes without impairment of the tensile properties of the rayon.

With the equipment used, it was not possible to perform experiments of short duration—such as up to 30 seconds exposure at the high temperatures. However, the data obtained on alkali degradation shows that exposures of short duration would not be injurious to the rayon. With proper equipment and a range of stable vat dyes the advantages of high speed dyeing at high temperatures is in the realm of possibility since viscose is alkali stable under these conditions.

Cellulose Acetate

1.—EXPERIMENTAL CELLULOSE ACETATE MATERIAL.—Two all-acetate fabrics were selected and well scoured before proceeding with the dyeing experiments. They were characteriazed as follows:

Fabric A.—A satin weave composed of filament warp and filling.

Fabric B.—A satin weave composed of filament warp and staple filling.

2.—FIBER STABILITY AT HIGH TEMPERATURES.—To test the stability of the acetate to the action of high temperatures in the presence of moisture, the two fabrics were subjected to the following conditions, using the same pressure vessel to be described in a later section on the dyeing of cellulose acetate:

Fabric A.—Condition No. 1—Pieces cut 12x10 inches and weighing 10 grams were placed in a dry condition in the stainless steel pressure vessel and exposed to steam at 20 pounds pressure (259° F.) for various times.

Fabric B.—Condition No. 1.—Treatment same as for Fabric A.

Condition No. 2.—Pieces cut 12x10 inches and weighing about 10 grams were submerged in water during the heating periods in the pressure vessel, using 15 pounds of steam (250° F.) for varying times.

The effect on breaking strengths by these treatments is given in Table XII.

As the table indicates, the percentage loss is, for practical purposes, the same for warp and filling in each fabric. This is to be expected for Test Fabric A since the warp and filling yarns were the same but the differences which might have shown up for Test Fabric B because of different yarn structure in warp and filling are not realized, either by exposure to steam or immersion in water. Furthermore, Test Fabric B consistently showed less loss by immersion in water at 250° F. than by action of steam at 259° F., although the difference is small and hardly of practical significance. In all cases of exposure to steam (Condition # 1), there was considerable dulling of the luster and a very great increase in the stiffness of the fabric, but, in sharp contrast, immersion in water produced much less loss of luster and actually increased the suppleness of the fabric. Contrariwise to the large losses of strength observed in Table V, other studies *(7)* on the action of steam on cellulose acetate satin fabric under conditions of lower temperature (225° F. as opposed to 250° F. and 259° F.) and shorter times (15 to 60 seconds as opposed to 3 to 30 minutes) have indicated little or no loss of breaking strength for relaxed specimens and a gain of 20% in strength of the warp held under tension during exposure with an accompanying 20% decrease of filling strengths of these same warp stressed specimens.

3.—GENERAL DYEING PROCEDURE.—There was conveniently available in the laboratory a small autoclave made of stainless steel. Preliminary trials in this equipment with the ordinary dispersed type of acetate dyes showed no differences between dyeings and dye solutions exposed to the metal of this autoclave and those protected from the possible action of the metal by inserting a glass container with a glass cover to shed drippings of condensate from the metal cover of the autoclave. Therefore, nearly all of the experiments to be described were made with the dye solutions in contact with the stainless steel.

Test Fabric B was used in all of the dyeing trials. This was the all cellulose acetate fabric having filament warp and staple filling yarns.

All dyeings were made in a standard dye bath consisting of:

0.25 grams long chain alcohol sulfate (Duponol WA Paste)
0.5 grams dye
1 liter water.

4.—HIGH TEMPERATURE CELLULOSE ACETATE DYEING.—*(a) Dyeing at High Temperatures with Dispersed Acetate Dyes.*

The three following acetate dyestuffs were used in making these experiments:

Dye	C. I. No.
Eastman Blue BNN	——
Celliton Fast Yellow CA (Pat.)	Pr. 242
Camacyl Brilliant Scarlet NC	——

Preliminary trials were made to ascertain the effect of increasing the time of exposure of the fabric to the dye liquor. As there was little difference in the appearance of the dyed fabrics when dyed at the high temperatures between 5 minutes and 30 minutes, 5 minutes was chosen for all subsequent dye trials at high temperatures. For the high temperature dyeings, the dyebath and a 10-gram sample of the fabric were placed in an 18-8 stainless steel container and heated to 250° F. for 5 minutes; then removed and rinsed in water until free of loose color; then inspected for levelness of dyeing, penetration and degree of freedom from specks and spots; also for general overall appearance.

For the purpose of selecting suitable controls, two sets of dyeings were made in glass beakers in the conventional manner. One set was dyed at 180° F. for 45 minutes using the same dye formula, volume of dyebath, and size sample that were used in the high temperature dyeings. The second set was dyed at 180° F. under the same conditions used for the first set, but only for 5 minutes in order to get a direct time comparison between the 180° F. dyeings and those made at 250° F.

The dyeings made at 180° F. for 45

minutes were level, well penetrated, and free of specks. Therefore, they were adopted as a standard. The samples dyed at 250° F. were in every case covered with dye specks, showing the lack of stability of the dyestuff dispersion at this temperature. The samples showed a very unlevel appearance. The exterior surfaces of the fabric which were exposed to the dyebath were dyed much more heavily than the fabric surfaces which were protected by a fold, or were in the interior of a roll of the fabric. These dyeings were so unevenly dyed that a true comparison of the dye take-up of the fabric between them and conventional dyeing made in a beaker at 180° F. for 45 minutes was impossible. However, to obtain some measure of the dye take-up, the exhausted dyebaths from both the dyeings at 250° F. for 5 minutes and those made at 180° F. for 45 minutes were compared and showed practically complete exhaustion of color in each case.

The dyeings made at 180° F. for 5 minutes were more level and better penetrated than those at the higher temperatures for the same length of time, although the dyebaths were not exhausted of color to the same extent, being about 90% exhausted for the yellow, 35% for the blue, and 25% for the scarlet.

(b) Dyeing at High Temperatures with Direct, Vat, and Acid Dyes

Three direct dyes, one vat dye, and three acid dyes, which normally leave acetate undyed, were selected for trials. It was thought that the high temperatures might swell the acetate fiber sufficiently to allow the penetration of these dyes into the fiber and cooling would cause the occlusion of an amount of dye sufficient to cause coloration.

The direct dyes used were:

Pontamine Sky Blue 6B	C. I. 518
Pontamine Fast Yellow RL	C. I. —
Pontamine Scarlet 4BA	C. I. 326

The acid dyes were:

Brilliant Alizarine Sky Blue BS	C. I. 1088
Azo Rubinole 3GP	C. I. ——
Xylene Fast Yellow 2GP	C. I. ——

Ten grams of fabric were immersed in a dyebath containing 1 gram per liter of dye and heated for five minutes at 250° F. Although there was some slight staining of the acetate fabric, there was no significant absorption of dye.

Application of Vat Blue BLN Double Paste (C. I. 1113) was made to an all-acetate satin by a pigment-pad-chemical-pad-steam continuous dyeing method (7) in which the steaming was accomplished in 30 seconds at temperatures of 214° F. to 216° F., with the warp under considerable tension. The fabric showed about 10% and 20% losses in warp and filling strengths respectively, saponification from 0.5% to 4.5%. Good dye fastness was shown to dry and moist crocking, three No. 3 A.A.T.C.C. washes, and Tentative A.A.T.C.C. Atmospheric Gases Tests (2 cycles). The tinctorial strength was excellent.

(c) Dye Transfer at High Temperatures

Samples of the dyeings made under the three conditions, viz., 180° F. for 5 minutes, 180° F. for 45 minutes, and 250° F. for 5 minutes, were individually placed, together with a piece of the undyed material of equal size, in a bath containing 0.25 grams of long chain alcohol sulfate (Duponol WA) in one liter of water and heated to 250° F. for 5 minutes. In every case, there was very slight staining of the undyed material.

A control was run at the same time, using a blank bath consisting of Duponol WA and water and heating to 180° F. for 45 minutes. Again there was very slight staining of the undyed material.

It may therefore be concluded that, within the range of the temperatures used in these tests, there is very slight transfer of dye from one part of the dyed fabric to another, and increasing the temperature has little effect upon color transfer.

5.—SUMMARY.—From solutions without dye auxiliaries, certain direct and acid dyes, which were examined, did not produce significant coloration at high temperatures. One vat dye, on the other hand, gave good tinctorial strength when applied by a pigment-pad-chemical-pad-steam continuous dyeing application. Therefore, within the compass of conditions imposed by these *batch* dyeing experiments there seems little likelihood of profitable benefits from high temperature dyeings on cellulose acetate with dispersed, direct, and acid dyestuffs but the results from the preliminary experiments on high speed continuous vat dyeing of cellulose acetate indicate further study may be profitable.

Nylon

1.—EXPERIMENTAL NYLON MATERIAL.—Yarn and fabric were used as indicated in the following tests:

Yarn

Saturation Values
Rate of Exhaustion
Fiber Diffusion Penetration
Tenacity Studies

Fabric

Transfer
Fastness
Junction (knit)
Chroming

For yarn, skeins of 70 - 34 - ½ Z—300 nylon were used for dyeing after a scour using 2% long chain alcohol sulfate ("Duponol" D Paste) 2% oleate soap and 1% trisodium phosphate. They were rinsed, dried and weighed, being found to vary only 1% in weight from the unscoured weight in any instance.

For fabric, a taffeta of bright nylon, 135 x 82, 70 - 34 - 72 yarns warp and filling, 2.33 oz./yd., 39" wide was used.

2.—FIBER STABILITY AT HIGH TEMPERATURES.—To study the action of various agents at normal and elevated temperatures, a bright high tenacity yarn was used that is designated by the manufacturer as 70-34-½ Z-300, indicating a 70-denier, 34-filament, ½ Z-twist yarn. The average tenacity of this yarn is 6.3 g./den., and the average elongation at the break 20.7%.

In the normal range of elongations (18-28%) of textile nylon, tenacity increases approximately 0.1 g./den., per 1% decrease in elongation. For example, a normal-tenacity yarn with a tenacity of 4.5 g./den., at 20% elongation would have a tenacity of 4.6 g./den., at 19% elongation. Accordingly, in comparing tenacity losses in the work reported below, all the tenacities were calculated for 20% residual elongation.

The Scott IP-2 Tester was used for all tenacity and elongation determinations.

Reference Yarn Data

Five determinations were obtained on each of ten skeins of yarn which had been wound off directly from the manufacturer's pirns. The average tenacity and elongation at the break for these fifty determinations was

Tenacity = 6.62 g./den; std. dev. = 38 g./den.

Elongation at Break = 18.2%; std. dev. = 2.18%.

Hence, the tenacity corrected to 20% elongation for the reference yarn was 6.4 g./den.

Effect of Normal Scour

Five skeins were scoured under conditions normal for nylon, namely:

2% long chain alcohol sulfate ("Duponol" D Paste)
2% Soap
1% Trisodium Phosphate

at 180° F. for one-half hour, followed by rinsing and drying.

Five break tests were made on each of these five skeins. The average figures for these twenty-five determinations were:

Tenacity = 6.59 g./den; std. dev. = 0.104 g./den.

Elongation at break = 19.9%; std. dev. = 1.92%.

The tenacity corrected to 20% elongation for the secured reference yarn was thus 6.58 g./den. When compared with the tenacity of the untreated reference yarn, it is seen that normal scouring has no adverse effect upon the nylon yarn.

Effect of Other Agents

In Table XIII, the experimentally determined tenacity and elongation figures are given for the acids, alkalies, soap and

TABLE XIII. Effect on Nylon Yarn Tenacity and Elongation from High Temperature Scouring and Dyeing with Various Detergents and Dyeing Assistants.

Agent	212° F.		248° F.	
	Ten.	Elong.	Ten.	Elong.
10% Formic Acid (90%)	5.4	22.1	5.4	24.6
10% Formic Acid (90%)	6.0	24.3	4.3	22.1
10% Acetic Acid (28%)	5.8	22.2	5.7	23.6
10% Acetic Acid (28%)	5.6	23.0	5.0	22.8
1% Sulfuric Acid (96%)	4.5	18.4	3.0	12.6
1% Sulfuric Acid (96%)	4.1	20.9	3.4	16.7
5% Sulfuric Acid (96%)	4.0	17.3	3.0	14.9
5% Sulfuric Acid (96%)	4.0	20.8	3.1	16.2
1% Trisodium Phosphate	4.3	20.4	3.0	14.0
2% Olive Oil Soap	4.2	19.7	2.5	12.2
0.5% Olive Oil Soap	3.8	17.3	3.6	17.6
2% Long Chain Alcohol Sulfate	3.9	12.5	3.1	14.5
2% Long Chain Alcohol Sulfate	4.8	18.7	3.1	14.5
2% Long Chain Alcohol Sulfate	4.6	19.3	4.0	23.0
0.5% Long Chain Alcohol Sulfate	6.0	24.4	5.8	20.0
0.5% Long Chain Alcohol Sulfate	5.7	21.4	4.6	22.2
0.5% Long Chain Alcohol Sulfate	3.9	18.4	2.5	13.8
0.5% Long Chain Alcohol Sulfate	4.1	20.9	1.7	9.5
0.5% Long Chain Alcohol Sulfate	4.7	24.7	4.0	19.9
0.5% Long Chain Alcohol Sulfate	5.5	29.4	3.9	21.8
0.5% $C_{17}H_{33}CON(CH_3)C_2H_4SO_3Na$	4.8	22.9	3.6	19.0
0.5% Long Chain Alkyl Betaine	5.3	27.2	4.0	20.9
0.5% Ethylene Oxide Condensation of Oleyl Sarcoside	5.4	27.5	4.3	22.6
0.5% Ethylene Oxide Condensation Product of a Long Chain Alkyl Phenol	5.5	29.2	3.6	20.0
0.5% Sodium Alkyl Aryl Sulfonate	5.2	28.7	4.5	23.3

TABLE XIV. Tenacities from Table XIII Adjusted to 20% Elongation.

Agent	Values of Tenacity at 20% Elongation		% Loss-Tenacity Based on 20% Elongation on Yarn	
	212° F.	248° F.	212° F.	248° F.
10% Formic Acid (90%)	6.0	5.2	6	18
10% Acetic Acid (28%)	6.0	5.7	6	10
1% Sulfuric Acid (96%)	4.2	2.7	34	57
5% Sulfuric Acid (96%)	3.9	2.6	39	59
1% Trisodium Phosphate	4.3	2.4	32	62
2% Olive Oil Soap	4.2	1.7	34	73
0.5% Olive Oil Soap	3.5	3.4	45	46
2% Long Chain Alcohol Sulfate	4.0	2.6	37	60
2% Long Chain Alcohol Sulfate	4.5	4.3	29	32
0.5% Long Chain Alcohol Sulfate	6.1	4.8	4	25
0.5% Long Chain Alcohol Sulfate	3.9	1.3	39	79
0.5% Long Chain Alcohol Sulfate	5.2	4.0	18	37
0.5% Long Chain Alcohol Sulfate	6.4	4.1	..	35
0.5% $C_{17}H_{33}CON(CH_3)C_2H_4SO_3Na$	5.1	3.5	20	45
0.5% Long Chain Alkyl Betaine	6.0	4.1	6	35
0.5% Ethylene Oxide Condensate of Oleyl Sarcoside	6.2	4.6	3	37
0.5% Ethylene Oxide Condensation Product of Long Chain Alkyl Phenol	6.4	3.6	..	43
0.5% Sodium Alkyl Aryl Sulfonate	6.1	4.8	4	25

detergents tested. All of these determinations were obtained with yarn from the same lot as that described above. Each determination represents one exposure at 212° F. and 248° F. to the conditions indicated and for some of the agents several determinations were made using different skeins of yarn in different baths. Five break tests were made on each skein so treated.

The amounts of agents used, given in percentage, are based on the weight of the nylon skein in the bath. All baths were run at a 1:40 volume for *one hour* at the temperature indicated.

The detergents used were all commercial products on the market; the amount indicated represents the concentration used of the commercial product based upon the weight of the nylon.

After exposure to the agents, all skeins were well rinsed, so that when dried none of the agents would remain in the yarn.

In order to obtain a better comparison of the results, all of the values given in Table XIII have been recalculated to obtain the tenacity corrected to 20% elongation. These recalculated figures are presented in Table XIV.

Accuracy of the Results

When the fifty tenacity determinations made on the reference yarn and the twenty-five determinations on the same yarn after scouring were considered, it was seen that relatively good precision in results was attained; for the first set the coefficient of variation of the individuals amounted to 5.7%, while with the second set the corresponding figure was 1.6%.

However, consideration of the several results obtained when, for example, the sodium salt of the long chain alcohol sulfate was used as the detergent reveals a wide variation (average = 5.40, standard deviation = 1.95 for individuals from 0.5% treatment) in the experimental results. As the entire work of exposing the skeins to the reaction agents and break-testing the resultant skeins was performed by competent technicians, it must be concluded that this type of work is susceptible to fairly large errors in the experimental results. Therefore, highly probable conclusions could be obtained only from a good statistical treatment of a much larger sample than any reported in the above table.

However, although it is diffcult to draw conclusions from the results with a high degree of certainty, the general trend indicates greater reactivity of the agents with nylon at 248° F. than at 212° F., as would be expected also with other fibers. This is especially pronounced in particular instances.

Summary

(1) The normal method of scouring nylon at 180° F. with soap, long chain alcohol sulfate ("Duponol" D Paste) and trisodium phosphate has no deleterious effect upon a 70-34-½ Z-300 yarn.

(2) Acetic and formic acids in quantities normally present in dyeing have no significantly adverse effect upon the fiber.

(3) Sulfuric acid and trisodium phosphate apparently tender this yarn substantially at 212° F. over a prolonged time, and even more so at 248° F.

(4) Olive oil soap and a number of commercial detergents apparently adversely effect nylon's tenacity after treatment for one hour at 212° F.; the action of these materials is more pronounced at elevated temperatures.

Although the adverse effect of several of the above agents on nylon is apparently quite substantial at 248° F., there are mitigating circumstances. It will be shown in subsequent sections that the rate of dyeing at 248° F. is markedly more rapid than at 212° F. so that a much shorter contact time of the nylon with the dyebath is required at 248° F. It is believed that with this decreased contact time, no more injury will occur to the nylon at the elevated temperature than at the "normal" temperature, 212° F.

Conclusion

It has been shown that sulfuric acid, trisodium phosphate, soap and certain detergents adversely affect the tenacity of nylon more greatly at 248° F. than at 212° F. for one hour.

3.—GENERAL DYEING PROCEDURE AND APPARATUS.—All dyeings were made in the glass pressure tube and metal shield illustrated in Figure 1. The tubes were turned end-over-end at 10 r. p. m. in a continually immersed condition in the temperature regulated fluid of the dyeing machine.

In all cases an 80 ml. dyebath was used with 2 grams of nylon yarn or fabric, i.e., a 1:40 bath ratio.

4.—HIGH TEMPERATURE NYLON

TABLE XV. Dyes Studied for Saturation Values on Nylon.

C. I. No.	Dyes	Dyeing Assistants
	Acetate	
—	Acetamine Yellow N	(2% "Duponol" D Paste
Pr. 244	Acetamine Scarlet B	(2% Soap
Pr. 228	Celanthrene Brilliant Blue FFS Conc. 200%	(1% Trisodium Phosphate
	Equalizing Acid	
639	Pontacyl Light Yellow GX	10% Formic Acid (90%)
1054	DuPont Anthraquinone Blue BN	10% Formic Acid (90%)
1080	DuPont Anthraquinone Violet 3R	10% Formic Acid (90%)
	Milling	
430	DuPont Milling Red SWB Conc. 125%	10% Formic Acid (90%)
642	DuPont Milling Yellow 5G Conc.	10% Formic Acid (90%)
833	Pontacyl Wool Blue BL Conc. 200%	10% Formic Acid (90%)
	Premetallized	
Pr. 144	Chromacyl Blue GG Conc. 200%	10% Formic Acid (90%)
Pr. 145	Chromacyl Bordeaux R	10% Formic Acid (90%)
Pr. 146	Chromacyl Orange R	10% Formic Acid (90%)
	Direct	
814	Pontamine Fast Yellow BBL Conc. 125%	10% Formic Acid (90%)
419	Pontamine Fast Red FCB Conc. 150%	10% Formic Acid (90%)
518	Pontamine Sky Blue 6BX Conc. 150%	10% Formic Acid (90%)

TABLE XVI. Saturation Values of Acetate Dyes on Nylon After One Hour of Dyeing.

C. I. No.	Dye	% Dye Left in bath After Dyeing		% Dye Present in Nylon After Test	
		212° F.	248° F.	212° F.	248° F.
—	8% Acetamine Yellow N	47	31	4.2	5.0
—	12% Acetamine Yellow N	..	41	..	7.0
—	18% Acetamine Yellow N	75	63	4.4	6.6
Pr. 244	8% Acetamine Scarlet B	28	23	5.7	6.1
Pr. 244	12% Acetamine Scarlet B	..	53	..	5.6
Pr. 244	18% Acetamine Scarlet B	64	31	6.4	12.4
Pr. 228	8% Celanthrene Brilliant Blue FSS Conc. 200%	52	38	3.8	5.0
Pr. 228	12% Celanthrene Brilliant Blue FFS Conc. 200%	..	40	..	7.1
Pr. 228	18% Celanthrene Brilliant Blue FSS Conc. 200%	64	56	6.3	7.8

TABLE XVII. Saturation Values of Acetate Dyes on Nylon at Various Times and Temperatures of Dyeing.

Dyes		% Dye Left After Test	% Dye Present on Skeins After Tests
18% Acetamine Yellow N (Pr. ....)	(1)	75.3	4.35
	(2)	80.5	4.39
	(3)	77.2	4.10
	(4)	67.75	5.8
	(5)	63.6	6.49
	(6)	50.2	8.9
18% Acetamine Scarlet B (Pr. 224)	(1)	65.9	6.13
	(2)	64.3	6.4
	(3)	62.7	6.7
	(4)	41.5	10.5
	(5)	31.1	12.4
	(6)	31.8	12.3
18% Celanthrene Brilliant Blue FFS Conc. 200% (Pr. 228)	(1)	65.0	6.25
	(2)	64.5	6.3
	(3)	63.1	6.55
	(4)	63.0	6.65
	(5)	56.5	7.8
	(6)	58.7	7.5

Notes: 1. ½ hour at 212° F.
2. 1 hour at 212° F.
3. 2 hours at 212° F.
4. ½ hour at 248° F.
5. 1 hour at 248° F.
6. 2 hours at 248° F.

Dyeing assistants on each
2% "Duponol"
2% Soap
1% Trisodium phosphate

DYEING.—(a) *Saturation Values at High Temperatures*

In the case of the acetate colors, 2% long chain alcohol sulfate ("Duponol" D Paste), 2% oleate soap and 1% trisodium phosphate were used as dyeing assistants. In the case of the acid, direct and premetallized dyes, 10% formic acid (90%) was selected as an optimum amount of acid to obtain an exhaust on all of the dyes selected for trials.

In preparing the dyebaths, the dye and the dyeing assistants were added to a master solution, and 80 ml. of this solution was held in a glass pressure tube for the time and required temperature specified in each instance.

In each dyeing, the skein was wrapped on a "Teflon" form to lessen the amount of tangling and entered dry into the dyebath.

Temperatures of 212° F. (control) and 248° F. were selected as being suitable for the present determinations.

After each trial, measurements were made by comparing an aliquot of each solution versus an aliquot of the original dye solution in the spectrophotometer. In preparing solutions for photometric comparisons, the acetate dyes were rinsed from the nylon with 40 ml. water. This rinse water and the dye liquor were diluted to 1000 ml. volume with c.p. acetone. Twenty milliliters of this solution was then added to 80 ml. acetone and comparisons made of these additions. In each case, 80 ml. of the original solution was diluted in a like manner and taken as standard.

The dyes studied and the dyeing assistants used are given in Table XV.

(i) Alkaline Dispersed Acetate Dyes

In Table XVI are given the results of 60 minute dyeings with acetate dyes made to estimate the saturation values at 212° F. and 248° F.

The next trials were run in order to determine whether one hour was a sufficient length of time to exhaust a given amount of acetate dye on nylon. Results are given in Table XVII.

Summary on Alkaline Dispersed Acetate Dyes

These dyes are generally stable at temperatures above the normal boiling point and show with some dyes an increased amount of build-up on nylon as the amount of available dye in the dyebath is increased. The affinity of the nylon fiber for these dyes is increased through the use of elevated temperatures and increased dyeing time.

(ii) Neutral and Acid Dyed Acid and Direct Dyes

Neutral and Alkali Dyed Acetate Dyes

Neutral dyeing of acid dyes favors lower exhaustion rate and better level dyeing characteristics, hence it is desirable except for the decreased saturation values at normal temperatures.

The following two series of trials were made in order to determine the effect of increasing temperature on the saturation values of several acid, direct and metallized dyes run one hour at 212° F. and 248° F., using 10% formic acid (90%) in one set (acid dyeing) and without any dyeing assistants in one set (neutral dyeings).

TABLE XVIII. Neutral Dyeing Versus Acid Dyeing Affinity.

C. I. No.	Dye	% Dye Present On Nylon After Test: Neutral Affinity 212° F.	Neutral Affinity 248° F	Acid Affinity 212° F.	Acid Affinity 248° F	% of Dye (Neutral/Acid) 212° F.	% of Dye (Neutral/Acid) 248° F
	Equalizing						
639	8% Pontacyl Light Yellow GX	0.8	1.5	1.6	1.6	51	90
1054	8% DuPont Anthraquinone Blue BN	0.3	0.3	2.0	3.2	15	9
1080	8% DuPont Anthraquinone Violet 3R	1.1	1.1	2.0	2.2	51	49
	Milling						
430	8% DuPont Milling Red SWB Conc. 125%	1.4	2.5	5.6	6.3	25	40
642	8% DuPont Milling Yellow 5G Conc.	3.3	3.9	6.1	6.1	53	63
833	8% Pontacyl Wool Blue B L Conc. 200%	1.9	2.3	5.3	5.5	36	42
	Metallized						
Pr. 144	8% Chromacyl Blue GG Conc. 200%	1.8	2.0	3.2	3.3	57	63
Pr. 146	8% Chromacyl Orange R	5.3	5.5	7.5	6.5	70	85
Pr. 145	8% Chromacyl Bordeaux R	1.3	1.4	3.8	3.8	34	36
	Direct						
814	8% Pontamine Fast Yellow BBL	0.91	1.2	4.5	5.3	20	23
419	8% Pontamine Fast Red FCB Conc. 150%	1.2	1.7	7.4	7.4	16	23
518	8% Pontamine Sky Blue 6BX Conc. 150%	0.29	0.73	3.5	4.0	8	18
	Acetate	Neutral Disper. Affinity		Alkali Disper. Affinity		% of Dye (Neutral/Alkali)	
—	8% Acetamine Yellow N	5.0	6.5	4.2	5.56	119	118
Pr. 244	8% Acetamine Scarlet B	7.1	6.5	4.2	6.1	125	107
Pr. 288	8% Celanthrene Brill. Blue FFS Conc. 200%	5.4	5.8	3.8	5.0	142	116

TABLE XIX. Nylon-to-Nylon Transfers.

C. I. No.	Dyes	Amount of Transfer at 248° F. vs. 212° F.
1080	DuPont Anthraquinone Violet 3R	No Increase
430	DuPont Milling Red SWB Conc. 125%	No Increase
Pr. 145	Chromacyl Bordeaux R	No Increase
419	Pintamine Fast Red FCB Conc. 150%	No Increase
639	Pontacyl Light Yellow GX	No Increase
1054	DuPont Anthraquinone Blue BN	Tr. Increase
642	DuPont Milling Yellow 5G Conc.	Tr. Increase
833	Pontacyl Wool Blue BL Conc. 200%	Notic. Increase
Pr. 146	Chromacyl Orange R	No Increase
Pr. 144	Chromacyl Blue 2G Conc. 200%	No Increase
814	Pontamine Fast Yellow BBL Conc. 125%	No Increase
518	Pontamine Sky Blue 6BX Conc. 150%	No Increase
145	DuPont Neutral Yellow GS	No Increase
—	DuPont Neutral Brown BGL	No Increase
—	DuPont Neutral Brown 2RS	No Increase
Pr. 206	DuPont Neutral Gray L	No Increase

TABLE XX. Nylon-to-Wool Transfers.

C. I. No.	Dyes	% Transfer (Nylon 100%) Wool —212° F.	Wool — 248° F.
1080	DuPont Anthraquinone Violet 3R	5	7
Pr. 145	Chromacyl Bordeaux R	18	45
430	DuPont Milling Red SWB Conc. 125%	2	5
419	Pontamine Fast Red FBC Conc. 150%	2.5	8

TABLE XXI. Wool-to-Nylon Transfers.

C. I. No.	Dyes	% Transfer (Wool 100%) Nylon —212° F.	Nylon — 248° F.
1080	DuPont Anthraquinone Violet 3R	4	6
430	DuPont Milling Red SWB Conc. 125%	1.2	1.6
Pr. 145	Chromacyl Bordeaux R	19	23.5
419	Pontamine Fast Red FCB Conc. 150%	2	5

In the case of the acetate dyes, neutral dyeings were made using 1% long chain alcohol sulfate ("Duponol" D Paste) alone based on the weight of the nylon to assist in dispersing the dye. These neutral dyeings can be compared, in Table XVIII, with normal alkaline dispersed dyeings using phosphate and soap for differences in saturation.

Table XVIII gives the amount of dye on the nylon after the tests, both acid and neutral dyeing, and also the ratio of dye on the nylon from neutral and acid dye-baths.

In the above series of tests, the dyes normally dyed in the presence of acid do not show any practical improvement by the use of increased temperature when dyed under either neutral or acid dyebath conditions.

The acetate dyes in the above series likewise show no marked improvement at the higher temperature when dyed neutral but the normal soap and phosphate dyeings (alkali dispersed) show some improvement at 248° F.

(b) Dye Transfer at High Temperatures

(i) Nylon-to-Nylon

A series of tests were conducted to determine whether increased dyeing temperatures produced superior leveling qualities (transfer) in the dyes listed in Table XIX.

These tests were made by making 0.5% dyeings of several dyes by their standard methods on the bright nylon fabric and introducing portions of these previously dyed pieces together with equal portions of undyed material into baths containing 0.5% long chain alcohol sulfate ("Duponol" D Paste) and 5% acetic acid (28%) in each instance and running for one hour at 212° F. or 248° F. After the above treatment, the pieces were rinsed and dried, photometric readings were made and each piece, both the dyed and the undyed original, were compared with portions of the original dyeing with the results as given in Table XIX.

The acetate dyes listed earlier, which are known to possess excellent leveling qualities when dyed at temperatures under the boil, show similar and satisfactory transfer when tested at 248° F. compared to 212° F.

(ii) Nylon-to-Wool

The following trials were made in order to determine degree of transfer of dye from previously dyed nylon to undyed wool at an elevated temperature, as compared to a like transfer at a normal dyeing temperature.

Portions of 2% dyeings of the dyes listed in Table XX were introduced into a bath containing an amount of acid equal to that normally used for these dyes and a weight of undyed wool serge equal to the nylon. They were then treated one hour at 212° F. and 248° F. and the following results obtained both photometrically by reflectance and corroborated by visual examination.

(iii) Wool-to-Nylon

In the trials shown in Table XXI pot dyeings were made in the same manner as the dyeings prepared for the nylon-to-wool trials, except that for these tests dyed wool and undyed nylon were introduced into each dyebath condition as previously stated.

(c) Union Dyeing of Nylon and Wool

A series of dyeings were made to de-

TABLE XXII. Depths of Shade of Nylon-Wool Unions at Various Dyeing Times and Temperatures.

Dye C. I. No.	212° F. Zero Time WOOL	212° F. Zero Time NYLON	212° F. One Hour WOOL	212° F. One Hour NYLON	248° F. Zero Time WOOL	248° F. Zero Time NYLON	248° F. One Hour WOOL	248° F. One Hour NYLON
1080	11.1	5.9	9.1	7.7	5.3	6.2	12.5	9.5
430	7.7	5.5	7.2	6.7	5.9	5.6	8.3	6.7
Pr. 145	8.3	4.4	10.0	5.0	8.0	5.3	10.5	5.6
419	9.5	9.5	10.0	10.0	7.7	9.5	9.5	11.1

The dyes actually used in these studies were the folowing:

C. I. No.	DYE
1080	DuPont Anthraquinone Violet 3 R
430	DuPont Milling Red SWB Conc. 125%
Pr. 145	Chromacyl Bordeaux R
419	Pontamine Fast Red FCB Conc. 150%

TABLE XXIII. Relative Depth of Shade at Zero to One Hour of Dyeing Time.

C. I. No.	Dye	Nylon 212° F.	Nylon 248° F.	Wool 212° F.	Wool 248° F.
1080	DuPont Anthraquinone Violet 3 R	76	66	122	42
430	DuPont Milling Red SWB Conc. 125%	88	83	100	74
Pr. 145	Chromacyl Bordeaux R	87	95	83	76
419	Pontamine Fast Red FCB Conc. 150%	95	86	95	81

TABLE XXIV. Relative Depth of Shade of Nylon to Wool when Dyed as a Union at Various Times and Temperatures.

C. I. No.	Dye	Zero Time 212° F.	Zero Time 248° F.	One Hour 212° F.	One Hour 248° F.
1080	DuPont Anthraquinone Violet 3R	53	119	85	76
430	DuPont Milling Red SWB Conc. 125%	82	95	93	80
Pr. 145	Chromacyl Bordeaux R	52	66	50	53
419	Pontamine Fast Red FCB Conc. 150%	100	124	100	117

termine if a better union could be obtained for these two fibers at high temperature.

For the union dyeing experiments, 2-gram portions each of nylon and wool fabric were introduced into four 2.0% dyebaths made up with each individual dye studied. Two of the baths were heated to 212° F. and the other two were heated to 248° F. The nylon and wool were removed from one of the dyebaths just as it reached its designated temperature. These dyeings represented the effect at zero time. The other two baths, one at 212° F. and the other at 248° F. were held at these temperatures for one hour. These latter dyeings represented the effect after one hour of time. Thus, for each dye studied, eight pieces of dyed fabric resulted according to the following pattern:

At 212° F.

(s) Wool at Zero time
(t) Nylon at Zero time
(u) Wool after one hour
(v) Nylon after one hour

At 248° F.

(w) Wool at Zero time
(x) Nylon at Zero time
(y) Wool after one hour
(z) Nylon after one hour

It would be of great interest to determine the separate amounts of dye on the nylon and wool pieces taken from each dyebath to obtain a measure of the dye affinity under the conditions imposed but this is chemically difficult, and involves many assumptions in a complicated estimation by reflectance spectrophotometry. Since the visual effect (depth of shade) is of considerable interest, it was deemed sufficient to measure the apparent luminous reflectance of the dyeings which in effect records them in a scale of gray tones similar to that obtained when the dyeings are photographed in black and white. For this purpose a Photovolt Reflectance Meter, Model 610, was used. The incident and reflected light passed through a tri-stimulus green filter and the instrument was standardized against a fresh surface of magnesium oxide as 100% reflectance.

Depth of shade (D) bears a reciprocal relationship to apparent luminous reflectance (R) and will be considered simply related, that is, $D = 100/R$.

Table XXII gives the depths of shade calculated from the photometer readings, low numbers representing light shades and high numbers dark shades.

Table XXII provides data for estimating answers to a number of questions, two of interest being (a) the relative extent to which dyeing of nylon and wool is complete at zero time compared to one hour of dyeing and (b) the relative depth of shade between nylon and wool dyed as a union under various conditions of time and temperature.

In Table XXIII the effect of continuing the dyeing for one hour after reaching the desired temperature (zero time) is expressed as one hundred times the ratio of the depth of shade at zero time of dyeing to that after one hour. The results of the ratio give small values when the depth of shade is lower at zero time than after on hour and high values when there is little difference. Values greater than 100 mean that a greater depth of shade was observed for the dyeing at zero time than after one hour.

In Table XXIV the extent to which the depth of shade on the nylon matches that on the wool is given. The values represent one hundred times the ratio of the depth of shade on nylon to that on wool. Such a ratio gives low numbers when the depth of shade on the nylon is less than on wool and vice versa. Values over 100 indicate that the shade on nylon was stronger than on its companion wool piece.

Summary: There are no definite trends in the data of practical importance which point to improvement in union dyeing of nylon and wool at high temperatures. The data shows in a very limited way that the direct dye gave very good unions at 212° F. and the premetallized the poorest at either temperature.

(d) Top Chroming of Nylon at High Temperatures

The following trials were made in order to determine the possible advantages obtained when chrome dyes are top-chromed at an elevated temperature as compared with normal dyeing temperatures.

The following dyestuffs were pot-dyed 2% shades on the bright nylon fabric using 10% acetic acid (28%) to exhaust them.

C. I. 343 Pontachrome Fast Yellow R Conc.
C. I. 1034 DuPont Alizarine Red S. Conc.
C. I. 1085 DuPont Alizarine Blue Black B.

Portions of the dyeings were then chromed one hour at 212° F. and 248° F. in a bath containing 5% acetic acid (28%) and 1% bichromate.

The Fast Yellow R. Conc. showed an improvement by chroming at the higher temperature. The dye is more completely developed at 248° F. in one hour's time, corresponding to the known effect of increasing chroming time when treated at a lower temperature.

Alizarine Red S Conc. shows a weaker, bluer and duller result when chromed at the elevated temperature. This dye was tested previously for stability in an acid medium unchromed and proved satisfactory. The results of the chroming trials indicate that this dye is not as stable when chromed at 248° F. as it is when chromed at 212° F. or when exposed to high temperatures before chroming.

Alizarine Blue Black B shows a definite improvement when chromed at 248° F.

TABLE XXV. Exhaustion of Dye on Nylon at High Temperatures at Various Times.

Dyestuff	Temperature ° F.	% Dye Exhausted on Nylon Time in minutes 0	10	30	60
1% Acetamine Scarlet B (Pr. 244)	212	99.0	99.5	99.4	99.2
	248	99.1	99.2	98.7	99.5
1% DuPont Anthraquinone Violet 3R (C.I. 1080)	212	99.96	100	...	...
	248	100	...	...	...
1% DuPont Milling Red SWB Conc. 125% (C.I. 430)	212	92	96	98	98
	248	84	96	100	...
1% Chromacyl Bordeaux R (Pr. 145)	212	46	67	76	83
	248	77	86	98	99
1% Pontamine Fast Red FCB Conc. 150% (C.I. 419).....	212	97	100	..	..
	248	100	...	..	..

The shade obtained at 248° F. is completely developed while the 212° F. trials gave a plum shade nearer to the acid dyeing.

Conclusions: No general statement can be made concerning improvement by high temperature chroming. Each dye would have to be examined and reported individually as some show a definite advantage when chromed at 248° F., while the chroming of others is definitely impaired.

(e) Junctions

This term applies to the effects produced by yarns having different dye affinities being in juxtaposition in a fabric when piece dyed. Bands, stripes, and barré effects result. In the case of nylon, the dye affinity is influenced by the degree the fiber is drawn during manufacture or during weaving and knitting and by differences in degree of polymerization (molecular weight). These give rise to so-called "Draw Junctions" and "Chemical Affinity Junctions" respectively. Since, to some degree, variations in these respects cannot be completely avoided in manufacture and weaving or knitting of nylon yarn, several trials were made in order to determine the effect of elevated temperatures in obtaining better junctions between nylon yarns of different properties, namely:

(1) 10% Draw Junction.
(2) Chemical Affinity Junction.

The dyestuffs used in these trials and the dyeing assistants are as follows:

0.1% DuPont Milling Red SWB Conc. 125% (C. I. 430) 1% Acetic Acid 28%.
0.1% Pontamine Fast Red FCB Conc. 150% (C. I. 419) 1% Acetic Acid 28%.
A mixture of the following dyes:
0.3% Acetamine Yellow N
0.2% Acetamine Scarlet B (Pr. 244)
0.1% Celanthrene Brilliant Blue FSS Conc. 200% (Pr. 238)
with a mixture of the following assistants:
2% "Duponol" D Paste
2% Soap
1% Trisodium phosphate.

Summary:

Acetate Dyes

In both the draw and chemical affinity junctions, the acetate dyes give good coverage at both 212° F. and 248° F. Therefore, there is no incentive in dyeing at the higher temperature.

Acid Dyes

In the draw junction, poor coverage is exhibited at 212° F. When dyed at 248° F. there is a marked improvement.

In the chemical junction, the coverage is inferior at 248° F. to that at 212° F. The variation in affinity caused by the chemical differences of the yarn are more pronounced when dyed at 248° F.

(f) Rate of Exhaustion of Acetate and Acid Dyes on Nylon at High Temperatures.

In the following tests, four 2-gram skeins of 70-34-½ Z-300 nylon were entered into separate baths containing the following dyes and dyeing assistants and raised to 212° F. in 12 minutes and 248° F. in 10 minutes. After reaching the required temperature the skeins were run for the following periods of time: 0, 10, 30, and 60 minutes. The skeins were removed from the dyebath and portions of the exhaust were measured photometrically to determine the amount of dye remaining. Table XXV gives the results.

Summary:

Generally the acid dyeings made at the higher temperatures exhausted more rapidly and in the instances where a complete exhaust was obtained, the exhaust was reached sooner than when dyed at 212° F.

(g) Fiber Diffusion Penetration at High Temperatures.

Cross-sections were made of the skeins dyed for different time intervals (Table XXVII) and photomicrographed to determine the degree of penetration of the dye. The following observations were made:

Pontamine Fast Red FCB Conc. 150% (C. I. 419).

The zero time at 212° F. showed a definite ring dyeing with 97% color exhausted on the fiber. The one-hour time at 212° F. was well penetrated with 100% exhaust.

The zero time at 248° F. showed a well-penetrated dyeing and 100% exhaust.

Chromacyl Bordeaux R (Pr. 145).

The zero time at 212° F. showed definite ring dyeing with 46% exhaust. The one-hour time at 212° F. showed ring dyeing, not completely penetrated with an 83% exhaust.

The zero time at 248° F. showed ring dyeing, not completely penetrated with 79% exhaust. The one-hour time showed good penetration with 99.5% exhaust.

DuPont Anthraquinone Violet 3R (C. I. 1080).

The zero time showed definite ring dyeing with a 99.9% exhaust. The one-hour time showed good penetration with 100% exhaust.

The zero and one-hour times at 248° F. showed good penetration with 100% exhaust in each case. See Figure 8.

DuPont Milling Red SWB Conc. 125% (C. I. 430).

The zero time at 212° F. was definitely ring dyed with 92.1% exhaust.

The one-hour time showed fair penetration with 98.5% exhaust.

The zero time at 248° F. showed fair penetration, not complete, with 84% exhaust. The one-hour time showed complete penetration and a 100% exhaust. See Figure 9.

Acetamine Scarlet B (Pr. 244).

The zero and one-hour times at both 212° F. and 248° F. show this dye to be well penetrated in each instance.

(h) Fastness Characteristics of High Temperature Dyeings.

The following representative list of dyes was dyed for one hour at 212° F. and 248° F. in 1% shades and at 248° F. for the higher strengths indicated below aimed at achieving fiber saturation of dyestuff:

2.24% Anthraquinone Violet 3R (C.I. 1080).
6.31% Milling Red SWB Conc. 125% (C.I. 430).
16.35% Chromacyl Orange R. (Pr. 146).
3.81% Chromacyl Bordeaux R. (Pr. 145).
7.36% Pontamine Fast Red FCB Conc. 150% (C.I. 419).
12.40% Acetamine Scarlet B. (Pr. 244).
6.55% Acetamine Yellow N. (C. I. ——)
7.80% Celanthrene Brilliant Blue FSS Conc. 200% (Pr. 228).

The following fastness tests were made:

1. Washing, AATCC No. 2.
2. Crocking, dry and moist.
3. Light, Fade-ometer.
   (a) 20 and 40 hours for 1% shades.
   (b) various times to produce noticeable fading at saturation levels.

The ratings of the 1% dyeings for all fastness tests were identical at both 212° F. and 248° F. for all dyes. Since saturation dyeings were made only at 248° F., comparison of differences attributable to temperature are not possible. However, a comparison of fastness ratings for the 248° F. dyeings at the 1% and saturation levels revealed (a) the expected

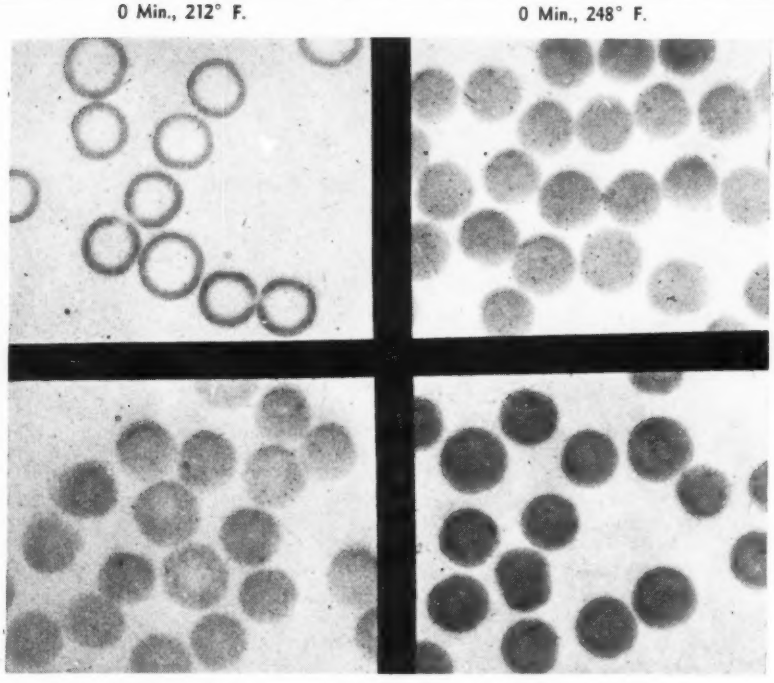


Figure 8. Du Pont Anthraquinone Violet 3R on Nylon.

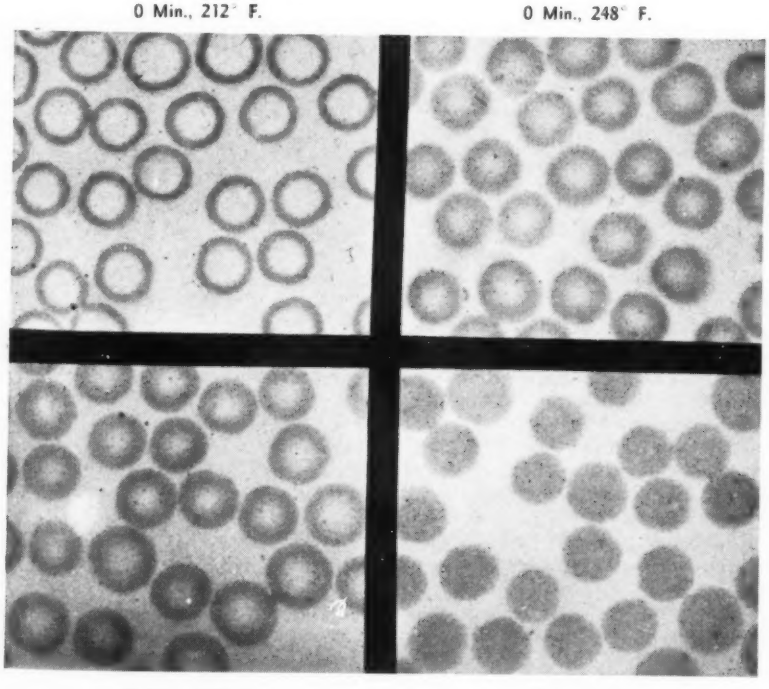


Figure 9. Du Pont Milling Red SWB Conc. 125% on Nylon.

noticeably less wash fastness of the saturation dyeings, (b) a remarkably similar crocking rating except for Acetamine Yellow N which rated 5 at 1% and 2 and 3 for dry and wet crocking respectively at 6.55%, and (c) a large expected increase in lightfastness except for Celanthrene Brilliant Blue FSS which showed no change in rating.

5.—SUMMARY.— *(a) Factors affecting dyeing adversely at 248° F. compared with 212° F.*

1. *Covering of Chemical Irregularities in Nylon Yarn*

With two acid dyes inferior junction coverage was obtained at 212° F. than at 248° F.

2. It is indicated that at elevated temperatures for one hour the tenacity of nylon is affected to some degree by strong acids, alkalies, soaps and some detergents.

(b) Factors showing no improvement at 248° F. compared to 212° F.

1. *Fastness properties.*

In general, no improvement was noted in dyeing nylon for periods of one hour.

2. Saturation Values.

While acetate dyes show some increase in saturation value at 248° F., the acid and direct dyes as classes show no practical improvement over those values obtained when the dyes are applied at a pH of 2.4 (formic acid) or 7 (neutral).

3. *Transfer Properties, Nylon-Nylon.*

As a class, acetate dyes show good transfer properties at 212° F. which is unchanged at higher temperatures. No real improvement in transfer was obtained with sixteen acid and direct dyes evaluated.

4. *Transfer Properties—Nylon to Wool, Wool to Nylon.*

Only one dye of four examined, Chromacyl Bordeaux R (Pr. 145), showed any real improvement in transfer at 248° F.

5. *Covering of Chemical and physical Irregularities in Nylon Yarn.*

With acetate dyes, no difference was noted in covering chemical and draw junctions, the coverage being satisfactory at both temperatures.

(c) Those factors showing improvement at 248 F. compared to 212° F.

1. *Rate of "Strike" of Acid Dyes.*

This factor is greater at 248° F. than at 212° F.

2. *Penetration of Acid Dyes.*

Cross-sectional views indicate that the rate of diffusion penetration of acid and direct dyes at 248° F. is very much greater than at 212° F.

3. *Ease of Chroming of Chrome Dyes.*

Dyes on the nylon fiber are gener-

TABLE XXVI. Breaking Strengths of Wool Yarn After Various Treatments.

Temp.	Time	pH 2.0 Aver. Value	pH 2.0 % Change	pH 2.0 Range[a]	pH 5.0 Aver. Value	pH 5.0 % Change	pH 5.0 Range[a]
221° F.	15 Min.	565	− 1.0	202	614	+ 6.0	120
221° F.	30 Min.	597	+ 4.7	260	632	+12.0	298
221° F.	60 Min.	585	+ 2.6	172	600	+ 5.3	258
221° F.	120 Min.	475	−16.7	104	544	− 4.6	135
230° F.	15 Min.	542	− 4.9	210	602	+ 5.6	219
230° F.	30 Min.	547	− 4.0	127	542	− 4.9	245
230° F.	60 Min.	525	− 7.9	86	525	− 7.9	198
230° F.	120 Min.	401	−29.7	165	495	−13.2	136
248° F.	15 Min.	588	+ 3.2	387	581	+ 1.9	134
248° F.	30 Min.	449	−21.2	179	595	+ 4.4	206
248° F.	60 Min.	462	−19.0	216	591	+ 3.7	188
248° F.	120 Min.	281	−51.7	138	161	−71.8	60
Grand Average		493.1			536.5		
Average Range				187.0			183.0
% Loss (Control—570 grams)		13.5%			5.9%		

a. Range is the difference between highest and lowest values for each treatment.

TABLE XXVII. Breaking Strengths of Wool Yarn After Dyeing at Different Conditions.

pH	C. I. No.	Color	212° F. Av. (Gm.)	212° F. % Change	212° F. Std. Dev.	250° F. Av. (Gm.)	250° F. % Change	250° F. Std. Dev.
2.0	Pr. 144	Blue 2G	659	+15.6	79	471	−17.4	45
2.0	Pr. 145	Bordeaux R	656	+15.1	37	453	−20.0	36
2.0	Pr. 146	Orange R	639	+11.4	32	596	+ 4.6	41
2.0		Average	650	+14.0		507	−11.1	
4.0	57	Napthol Red 6B	620	+ 8.8c	93	619	+ 8.6c	64
4.0	639	Xylene Lt. Yellow 2G	648	+13.7a	69	627	+10.0c	59
4.0	1054	Alizarine Saphire B	648	+13.7a	110	713	+25.1a	65
4.0		Average	639	+12.1a		653	+14.6a	
6.0	1078	Alizarine Cyanine Green CG	572	+ 0.4c	60	671	+17.7a	57
6.0	1085	Alizarine Blue Black B	563	+ 0.4c	60	513	−10.0c	47
6.0	833	Wool Fast Blue B	637	+11.8a	81	574	+ 0.7c	39
6.0		Average	601	+ 5.4c		586	+ 2.8c	

Notes: Relative to the 570 gram average of 10 replicate breaks and standard deviation 83 on the untreated (control) yarns,
a—significantly stronger
b—significantly weaker
c—insignificantly different,
these notations being based on a range of three standard deviations which assures a correct statement of significance 99.7% of the time.

ally more easily chromed to the true shade at 248° F. than at 212° F. Indications are that an examination of additional colors is required to determine color stability to the chroming conditions.

4. Covering of Physical Irregularities in Nylon Yarn

A marked improvement is obtained at 248° F. in covering junctions caused by physical variations in nylon yarn with acid dyes. Acetate dyes level well at 212° F., so there is no incentive to dye at the higher temperature with this type of dyestuff.

Conclusion:

As is generally true for all dyeing methods, high temperature dyeing of nylon has some advantages and some disadvantages. The improved diffusion penetration, greater strike and marked betterment in covering of physical junctions with acid and direct dyes at 248° F. indicate the possibility of developing high speed continuous dyeing processes. It appears reasonable that certain factors which have appeared to disadvantage in the slow batch methods used in these studies, for example, loss of tenacity by exposure to certain dyeing assistants, will tend to vanish as the dyeing time is decreased.

Wool

1.—EXPERIMENTAL WOOL MATERIAL.—Two hundred pounds of worsted yarn, 2/20-50's grade, were scoured in a four bowl Sargent scouring train, using a sodium alkylaryl sulfonate, soda ash, and sodium metasilicate. After passing through the scouring train, the lot was washed three additional times in water for 15 minutes at 110° F. A fourth bath was made up and a temperature of 120° F. was maintained. Enough acetic acid was added to neutralize practically all excess alkalinity. The wool was dried and pH determinations were made according to the ASTM procedure. The aqueous solution in contact with the wool had a pH of 8.0.

Standard weight skeins were prepared after conditioning at 70° F. and 65% relative humidity for 24 hours.

Dyeings were made in baths using distilled water at a ratio of 1:30.

2.—FIBER STABILITY AT HIGH TEMPERATURES.—Wool has the reputation of being a somewhat heat sensitive fiber, consequently it was deemed important to carefully assess the reaction of wool to the interactions of heat, acidity, and time without dye. To estimate the relative importance of these three variables on the strength of wool yarn, a 4 x 4 Latin Square plan of experiments was set up to cover pH's 2.0, 5.0, 7.0, 9.0, times 5, 20, 60, 240 minutes and temperatures 221° F., 239° F., 257° F., and 275° F. Within the ranges set up for these variables, analysis of the breaking strength results (10 replications on each of the 16 skeins, using a Scott IP-2 tester with a 1000 gram weight) showed temperature and time to be very significant factors, the increase in degradation was directly proportional to increases in these variables. pH was also significant, particularly above and below the range 5.0 to 7.0. From these results a second series was planned to cover the following conditions: temperatures 221° F., 230° F., 248° F., dyeing times 15, 30, 60, 120 minutes, and pH's 2.0 and 5.0. Table XXVI gives the results of the second set of tests, each value being the average of 10 breaks on the skein from each treatment. Gains in strength relative to a control (the average of 10 breaks on untreated yarn) are due to variation in yarn strength and possibly the effect of felting action during dyeing.

Analysis of the data in Table XXVI showed once again that the effects of time and temperature were each independently very significant in relation to strength loss. The interaction between time and temperature was also significant, i.e., the degradation due to time depended strongly on the temperature level. Again, the loss of strength at pH 2.0 was greater than at 5.0, especially for the longest time.

It was concluded from the above data that maximum safe conditions from a commercially practical viewpoint for batch dyeing operations are 250° F. for 60 minutes at pH's 2.0, 4.0, and 6.0. These three pH's are most appropriate for the equalizing, premetallized, and milling dyes respectively.

When the dyeings were completed using the procedures and techniques explained later in this report, sample skeins were chosen at random from among all the treatments involved. One skein was taken for each pH level and a set of such skeins taken for the dyeing temperatures 212° F. and 250° F. The average breaking strength values resulting from the 10 determinations on each skein are shown in Table XXVII.

TABLE XXVIII. Exhaustion of Wool Dyebaths Under Various Conditions.

Dyes	Minutes at 250° F.					Min. at 212° F.
	0	2	5	10	30	60
Neolan Blue 2G (Pr. 144)						
% color removed from dyebath	96	98	99	99	96.5	93
pH of exhausted bath (77° F.+)	2.0	2.0	2.0	2.0	2.0	2.0
Neolan Bordeaux R (Pr. 145)						
% color removed from dyebath	83	84	83	85.5	83.5	85
pH of exhausted bath (77° F.)	1.9	1.9	1.9	1.9	1.9	2.0
Neolan Orange R (Pr. 146)						
% color removed from dyebath	95	98	97.5	98	95	85
pH of exhausted bath (77° F.)	2.1	2.1	2.1	2.1	2.1	2.0
Amido Naphthol Red 6B (C. I. 57)						
% color removed from dyebath	68	72	68	70	73	83
pH of exhausted bath (77° F.)	4.0	4.0	4.0	4.0	4.0	4.2
Xylene Light Yellow (C. I. 639)						
% color removed from dyebath	71	74	74.5	73	75	81
pH of exhausted bath (77° F.)	4.1	3.9	4.0	4.1	4.1	4.2
Alizarin Saphirol B (C. I. 1050)						
% color removed from dyebath	71	73	75	67	70.5	86
pH of exhausted bath (77° F.)	4.1	4.1	4.1	4.0	4.0	4.2
Wool Fast Blue B (C. I. 833)						
% color removed from dyebath	84.5	85	83.5	85.5	85.5	88
pH of exhausted bath (77° F.)	6.2	6.0	6.0	6.0	6.0	6.1
Alizarin Cyanine Green CG (C. I. 1078)						
% color removed from dyebath	59.5	75	73	70.5	80	83
pH of exhausted bath (77° F.)	6.0	6.0	6.1	6.0	6.0	6.0
Alizarin Blue Black B (C. I. 1085)						
% color removed from dyebath	89	92.5	90	89.5	89.5	80
pH of exhausted bath (77° F.)	6.1	6.1	6.2	6.0	6.1	6.0

Added Remarks:

1. It seems likely that the significant strength increases are due solely to the felting of the two plys of yarn during dyeing.
2. There is no significant effect on strength attributable to the different dyes. This finding is not altogether in agreement with findings by Tucker *(11)*, and Goodall *(12)*, who found that some dyes cause strength decreases, other no strength changes. Possibly the use of low percentages of the dyes, 1% on yarn weight, do not show this effect.
3. At the time-temperature conditions used in this study, the most favorable pH conditions are for equalizing and milling dyes.

As was anticipated from the results of the preliminary experiments, the yarn strength was not lowered under the operating conditions chosen except at the pH level of 2.0. The strength loss which did occur at this level was definitely significant, however not serious. A dyeing temperature of 250° F. can be used safely for periods less than an hour especially in the pH range 4.0 to 6.0.

In summary, the estimated safe limits for batch dyeing would be 250° F. for periods up to 60 minutes in the pH range of 2.0 to 6.0 (possibly 7.0).

3.—GENERAL DYEING PROCEDURE.—Photographs of the apparatus are shown in Figure 2. The dyebath was contained in the pyrex pressure tube described earlier and shown in Figure 1. This assembly was revolved at 14 r.p.m. while completely immersed in a diethylene glycol bath adjusted to the desired temperatures. All dyeings used 1% dyestuff, based on the weight of the wool. Acetic acid was used to obtain pH 6 and sulfuric acid for pH's 2 and pH 4. Ten per cent calcined Glauber's salt was used only with the equalizing dyestuffs C.I. 57, C.I. 639, and C.I. 1054. pH measurements were made at 77° F. with a glass electrode. Dyeings were made in baths containing distilled water in a bath-to-material ratio of 30:1.

4.—HIGH TEMPERATURE DYEINGS—*(a) Exhaustion at High Temperatures at Various Times.*

Table XXVIII gives the results of the dyeing trials at the various conditions. Dyebath exhaustion was determined photometrically.

It will be noted from the table that dyebath equilibrium is secured at the end of two minutes at 250° F. The exhaustion for the equalizing dyes is less at 250° F. than at 212° F., whereas the milling and metallized deystuffs show no distinct trend in this respect.

(b) Fiber Diffusion Penetration

Cross sections made of the dyeings described in Table XXVIII were examined microscopically for penetration and uniformity of dye in the fibers. Representative photomicrographs are shown in Figures 10, 11, 12 and 13.

In general, five minutes at 250° F. produces the same degree of fiber penetration and uniformity of color as one hour at 212° F. This is particularly significant in the case of the milling and metallized type of dyestuffs since these types frequently require prolonged treatment at 212° F. for the best penetration and uniform results. In some cases, even this does not produce the desired effect with milling colors.

To study the effect of high temperature on penetration under normally adverse conditions, dyeings at pH 4 instead of pH 6 were made with Alizarine Blue Black B (C.I. 1085) and Wool Fast Blue B (C.I. 833) at 212° F. and 250° F. for time intervals of 2, 5, 15 and 30 minutes. Cross sections were made of these and photomicrographs were made of the Wool Fast Blue B dyeings, presented in Figure 14 A & B.

Penetration and attainment of uniformity of color on the fiber proceeds slowly at 212° F. At 250° F., however, these take place rapidly, 5 minutes at this temperature producing results equal to those at 212° F. for 60 minutes. It is especially noteworthy that superior results are secured at 250° F. by a prolongation of the time interval; so that, in 15 minutes at 250° F. penetration and uniformity of color on the fibers are better than was obtained at 212° F. for 60 minutes.

(c) Dye Penetration Within Yarns for Frieze Fabrics.

Carpet yarn used in frieze or hard twist rugs and having 8½ turns per inch was treated for these experiments by dyeing at 212° F. and 250° F. for various time intervals up to 60 minutes with the following dyes:

Amido Naphthol Red 6B C. I. 57 (pH 4).
Alizarine Blue Black B C. I. 1085 (pH 4 and 7).
Wool Fast Blue B C. I. 833 (pH 4 and 7).

No appreciable differences in degree of penetration between the two temperatures was observed for any of the dyes. Penetration was not complete for any dyeing but improved with increased dyeing time.

(d) Dye Transfer at High Temperatures.

Further studies of the influence of high temperature on leveling of dyes involved results of transfer tests. Pieces of scoured worsted cloth were dyed with Wool Fast Blue (C. I. 833) and Alizarine Blue Black B (C. I. 1085) at 212° F. for 30 minutes at a definite pH. To the pieces of the cloth from each of these dyeings there was attached an equal weight of undyed cloth and the pair was returned to the dyebath. Dyeing was then continued for 2, 15 and 60 minute intervals at both pH 4 and pH 6.

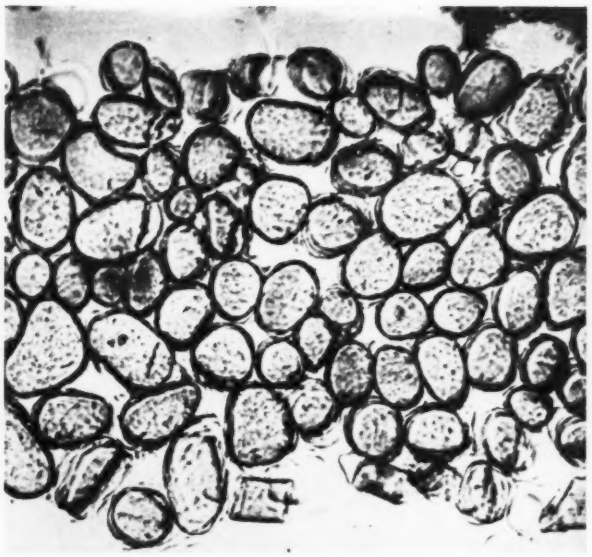
In all cases, at 212° F. color transfer was poor, increasing only slightly with time. At 250° F., however, color transfer was rapid, being as extensive at the end of two minutes at this temperature as it was at 212° F. in 60 minutes. Further, the amount of transfer at 250° F. increased rapidly with time, so that at the

60 Min., 212° F.

5 Min., 250° F.

Fig. 10. Wool Fast Blue B (C. I. 833)

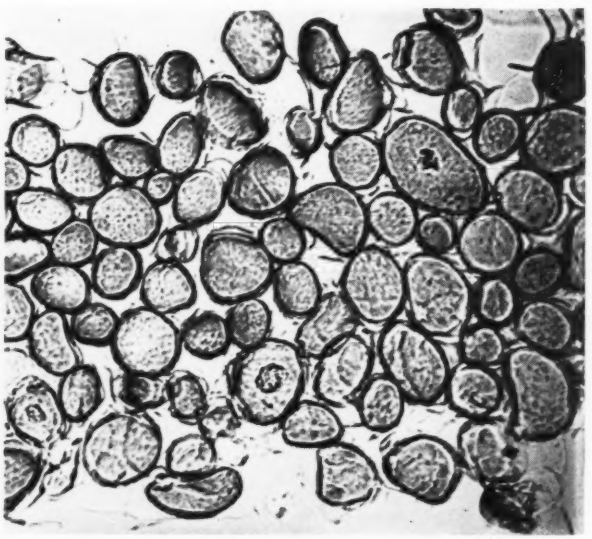
60 Min., 212° F.



5 Min., 250° F.

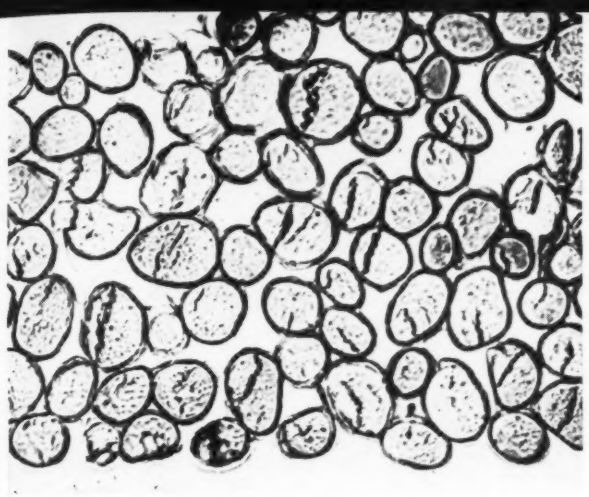
Figure 11. Amide Naphthol Red 6B (C. I. 57)

60 Min., 212° F.



5 Min., 250° F.

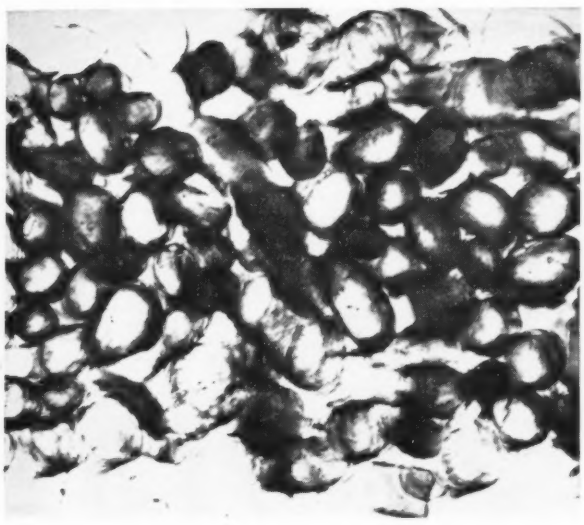
Figure 12. Alizarine Saphirol B (C. I. 1054)



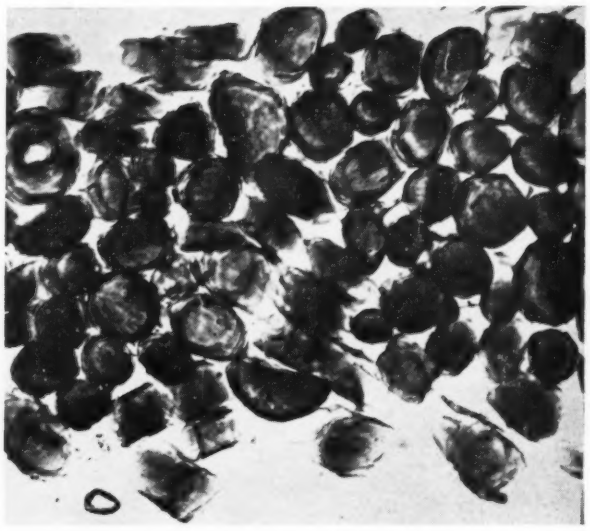
60 Min., 212° F.

5 Min., 250° F.

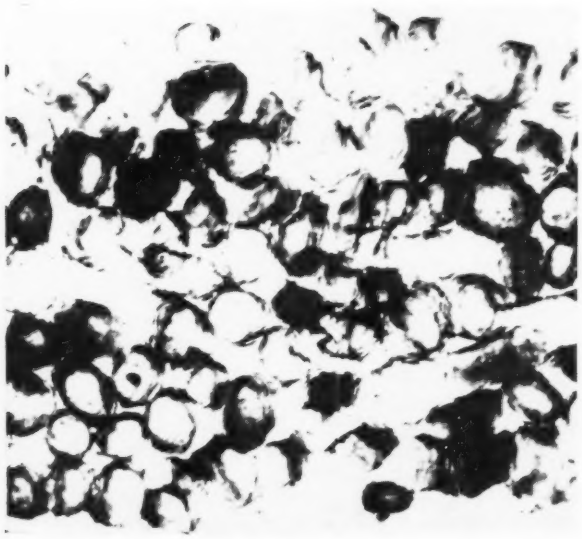
Figure 13. Neolan Bordeaux R (Pr. 145)



2 Min., 212° F.



2 Min., 250° F.



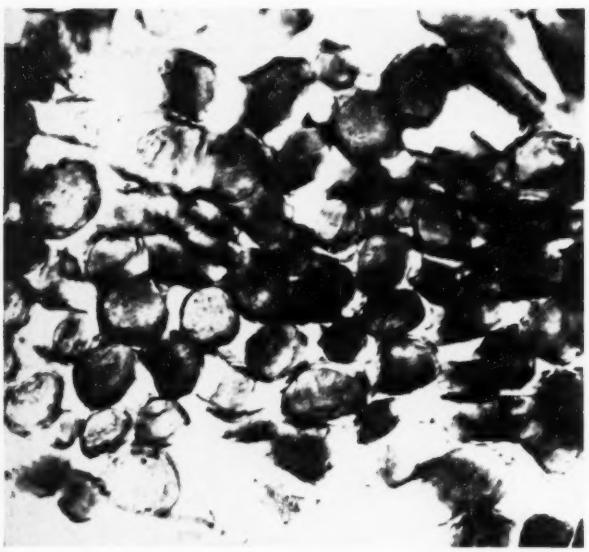
5 Min., 212° F.

5 Min., 250° F.

Figure 14A. Wool Fast Blue (C. I. 833)

15 Min., 212° F.

15 Min., 250° F.



30 Min., 212° F.

30 Min., 250° F.

Figure 14B. Wool Fast Blue B (C. I. 833)

end of 60 minutes at 250° F., for those dyeings made at pH 6, both pieces of cloth were uniform in shade and depth. Dye transfer at pH 4 was considerably less than that at pH 6 at either temperature. However, the high temperature transfer at pH 4 was quite striking.

The leveling effect of high temperature dyeing is illustrated in Figure 15 for Wool Fast Blue B (C. I. 833) at pH 6.

(e) Fastness Characteristics of High Temperature Dyeings.

The dyeings listed in Table XXVIII were compared for fastness to the following tests:

(a) 25, 50, 100 hours in the Fade-O-Meter.
(b) AATCC Washing Test #2 for level-dyeing colors.
(c) AATCC Washing Tests #3 and #4 for milling and metallized dyes.
(d) AATCC Crocking Test.

There was no difference in light, crocking, and wash fastness between dyeings made at 212° F. and 250° F.

5.—SUMMARY.—The basic advantages to be gained by dyeing wool at high temperatures are, from the experiments described, the following:

1. For short dyeing times, better diffusion within fibers.
2. For short dyeing times, a desirable decrease in fiber selectivity.
3. Marked improvements in color transfer.
4. Many-fold increase in speed of dyeing.

It is an obvious consequence of these advantages that a dyer should find production of level shades easier and milling colors at high temperatures acting more like level-dyeing (equalizing) dyes at 212° F. He can expect these advantages to be realized along with a step-up in production of more than ten times if the proper mechanical facilities are made available to him.

The above-stated advantages can be obtained:

1. Without sacrificing light, crock, and wash fastness.
2. Without impairing the physical properties of the wool.

It is quite possible that using still higher temperatures and shorter time intervals, continuous practical dyeing can be performed which will be completely satisfactory in penetration and levelness compared to the present time-consuming batch methods.

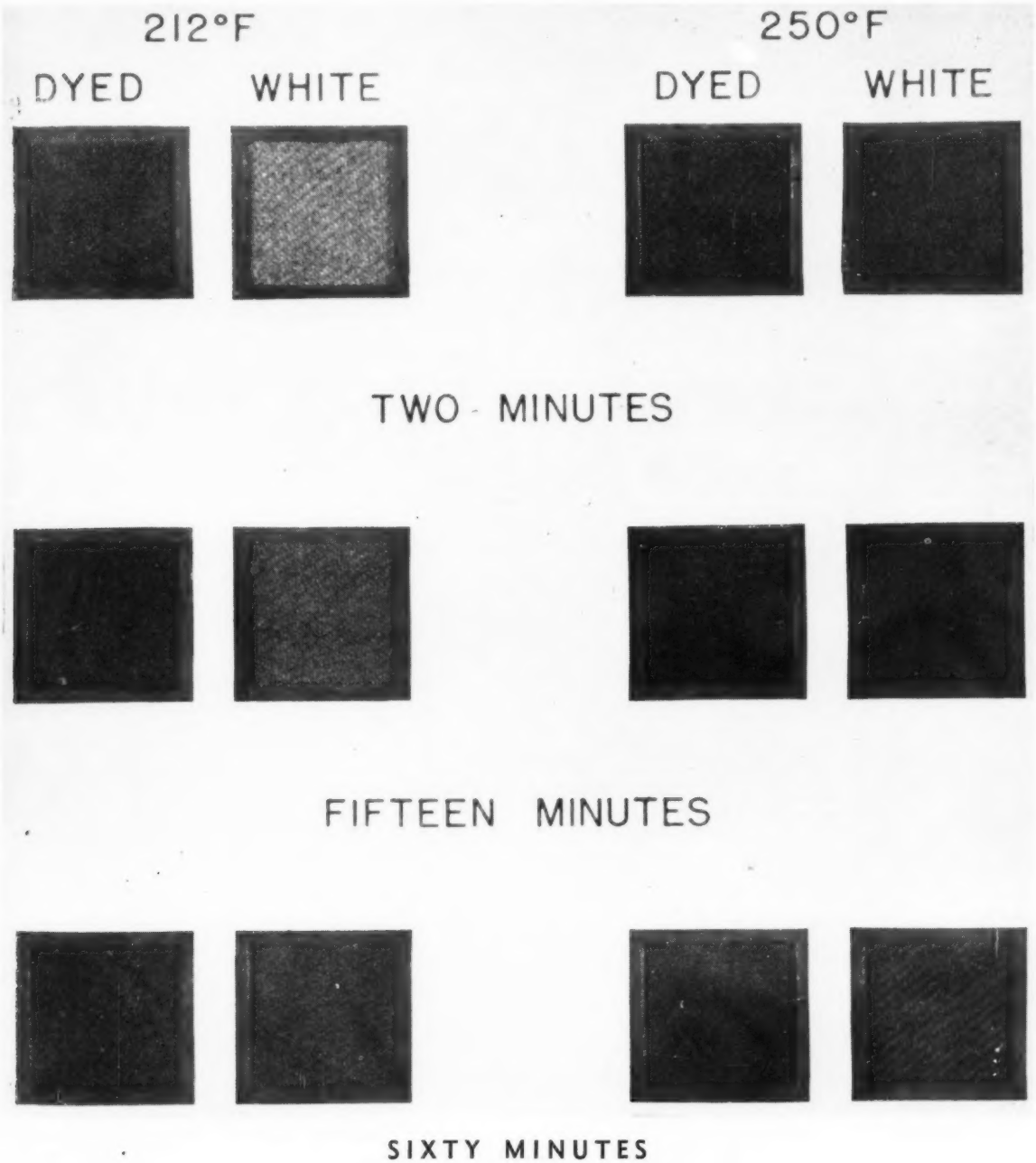


Figure 15. 1% Wool Fast Blue B (C. I. 833)

VII. General Summary

A.—INTRODUCTION.—Each of the fibers was subjected to a number of experimental variables, such as thermal stability or diffusion penetration. The study was planned so that the same experimental variables were applied to practically every fiber. Whenever three or more of these fibers responded advantageously to high temperatures, the generality of the advantage became more acceptable and important. The advantages with respect to each fiber and its associated types of dyes have been briefly summarized at the end of each fiber section, therefore, only the extent of the *generality* of advantages of high temperature dyeing will be dealt with here.

B.—THERMAL STABILITY OF FIBERS.—Rayon and wool proved physically stable at the temperatures and times studied. Cotton, though not tested in these studies, is known to be stable. It can be concluded with fair certainty that further development of high speed dyeing will not be handicapped by fiber instability. Both acetate and nylon may very well prove amenable to high tem-

perature dyeing if considerably shorter exposure times than were involved in these studies can be arranged.

C.—THERMAL STABILITY OF DYES. There appears to be many dyes in each class which can tolerate high temperatures. Certain individuals will prove too sensitive for practical use but in general the stabilities in this study have been adequate. The vat dyestuffs as a class were least resistant. They were exposed in these trials to the relatively long time of thirty minutes at the high temperature of 236° F. Shorter times of the order of one or two minutes and less undoubtedly would find a higher percentage of these dyes acceptable.

D.—RELATIVE EXHAUSTION.—No measurements were made on fibers other than nylon and wool and for both of these fibers some dyes exhausted more completely, others no differently, and still others less completely. Therefore, more data would be necessary to obtain a good generalization.

E.—RELATIVE DEGREE OF TRANSFER.—For soluble colors there was no exception to the generalization that more complete transfer resulted from exposure to high temperatures. Many difficultly leveling dyes gave evidence of behaving as level dyeing dyes at high temperatures. Therefore, the number of level dyeing soluble dyes would be considerably increased by high temperature dyeing.

F.—RELATIVE FASTNESS CHARACTERISTICS.—The dyed material of three fibers were subjected to fastness tests. There was usually no difference between dyeings at ordinary and high temperatures. However, vat dyes on cotton tended to be slightly inferior in general fastness properties when dyed at high temperatures.

G.—RELATIVE FIBER DIFFUSION PENETRATION — High temperatures greatly increased fiber diffusion penetration in all cases examined.

H.—CONCLUSION.—The increase in speed, leveling and diffusion found in high temperature dyeing results in a combination preeminently adaptable to high speed continuous dyeing with noteworthy gains in fiber quality and economies from volume production.

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Continental Mills.
E. I. du Pont de Nemours and Company.
Hellwig Dyeing Corporation.
James Lees and Sons Company.
Joseph Bancroft and Sons Company.
Philadelphia Textile Institute.
Rohm & Haas Company.
Scholler Brothers, Incorporated.

—◆ ◆—

Dyeing and Finishing—

(*Concluded from page* P8)

and pass the goods through a solution of sodium bicarbonate, which facilitates removal of caustic soda by conversion to soda ash. The cloth may then be plaited into trucks and taken to the rope washers for soaping.

The distinguishing feature of the Williams Unit is its relatively small capacity, a fifty inch unit holding about 72 gallons. Contrasting this volume with the 1400 gallons required by the old "booster" box brings to mind the savings in chemicals effected by this machine.

Remarks on the Williams machine method have dealt with its use in vat dyestuff application, and by the pigment method. The reduced padding method followed by re-reduction in the unit has been found satisfactory for dyeing of light shades, as well as for the dyeing of spun rayon-acetate blends in which it is desired to reserve the acetate. In addition to vat colors, this method has also proved of value for the dyeing of direct colors, sulfur colors and of naphthols.

The other new method to which we have referred, the Pad Steam process, has been in use for a few years and has been found, like the Williams machine method, to yield shades with vat colors comparable in all respects to those obtained by the pad-jig method, surpassing in fastness to washing those obtained by the "booster" box method.

The cloth is first padded with vat dyestuff in pigment form in a two or three roll pad. The padding bath contains in addition to dyestuff, a wetting agent if desired, and caustic soda, provided the pigmented cloth is not to be dried. The drying operation, when conducted, is best accomplished in the hot flue type of dryer to avoid migration of pigment. In either event the cloth, after cooling, is passed through a three roll chemical pad. This chemical pad is made up of caustic soda, sodium hydrosulfite, a small quantity of pad liquor and common salt. It is advisable that this chemical pad be kept as near room temperature as possible, as it is desirable to minimize reduction of the dyestuff at this point. Higher temperatures would result in dyeing action in the pad box which would introduce difficulties in shade control. During the run, caustic soda and hydrosufite are fed into the chemical pad in sufficient quantities to maintain starting concentrations. These quantities will vary to some extent depending upon the set on the chemical pad; the heavier the set, the greater the concentration of chemicals required.

The cloth is immediately conducted through a steam box for periods from 5-20 seconds, at temperatures ranging from 214-218° F. It is essential that air be excluded from this box, which is accomplished by means of a water seal at the point of exit of the cloth. It is during this steaming that reduction and fixation of vat dyestuff occurs. After the steamer come the usual rinsing, oxidizing, soaping and rinsing operations. These vary in different plants, some making use of sodium bicarbonate after rinsing, as the cloth leaves the steamer, and others using chemical oxidizing agents.

Outside of vat dyestuff application, the pad-steam set up has been used successfully for the dyeing of sulfur colors and naphthols.

TEXTILE COLORIST and CONVERTER

Section

DERFLA HOWES SINGLETON
Editor

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● Commencing with this issue, the *Textile Colorist and Converter* is incorporated into the *American Dyestuff Reporter*. In this way, the publishers believe that the scope of each will be both heightened and broadened.

The subject matter of the *Textile Colorist and Converter Section*, as well as its regular departments, will remain devoted as they have been, to the interests of the fabric field: converting, finish, color, design and markets. At the same time, this move is designed to give readers of both publications more complete service.

A fortnightly letter of news and views

Converting Markets

December 31, 1948

Dear Derfla:

Conditions in the rayon goods market got so tough last month that one converter staged his annual Christmas festivities at Pierre's instead of at the Waldorf.

Seriously, though, the going did get a little rough. Liquidation of excess goods often went to extremes. At times the prices of some of the more distressed cloths were forced to levels below any probable basis of replacement in the immediate future.

The resulting inventory write-offs, even by the many converters strong enough to hold for better prices, must have added up to a tidy figure. Integrations and others should have made good use of those "reserves for inventory loss" we used to hear so much about.

Depreciation of this sort could probably not become much greater without causing trouble for some of our friends. Hence, we have probably seen the worst of the shake-out and the next 30 days ought to mark the beginning of some improvement. Even at this writing we can see a few signs of quickening.

Apart from the fact that the reaction has already gone so very far in the secondary rayon gray goods market, there are other reasons for expecting some flurries of demand before long. The Spring wholesale market is already upon us. Although the Christmas trade lacked the phenomenal strength of recent years, many retailers now feel less disturbed than when dollar volume first began skidding 60 days ago.

By now most stores (and converters, and mills) realize that every day isn't going to be the Feast of St. John, but that things aren't so bad after all. Most significant from the standpoint of unit sales prospects over the next several months, the stores will have impressive values to offer the consumer in merchandise made of cottons and rayons.

There is going to be plenty of promotional ammunition for all classes of retailers. To be sure, there is now fairly definite evidence that general business conditions have been softening, but we haven't yet reached the point where the consumer is uninterested in price attractions—especially when combined with stimulating styles.

Downtown in the cotton goods market conditions during December were much calmer and firmer than uptown in the rayon goods section. The differences in the climate of these two markets were natural enough. Cottons began their readjustment nearly 12 months ago and seemingly have already passed through the roughest period of their deflation.

This is not to say that everything is wonderful in Worth Street. Domestic business has generally lacked punch and export business, apart from occasional bursts of speed, no longer comes in bunches. From the standpoint of our converting friends, probably the most interesting development is the way the biggest fine goods integration has been sharpening its pencil for all available business in finished cloth.

Converters are not finding it too easy to meet this integration's forceful competition. Here's a situation that could evolve into that battle between machinery and merchandising manpower which one of our shrewdest observers talked about in this magazine some months ago. If it happened in cottons, would rayons be far behind?

Some of our mill friends have recently rued the fact that converters held back the processing of rayon gray goods on a grand scale during November and December. No one likes to see the loss of initiative and our mill friends may have been quite right in suspecting that some distributors became over-timid when the market turned on them so abruptly. Yet there certainly were sound reasons for a policy of stop, look and listen.

With many secondary prices withering away and some sellers of rayon dress goods sacrificing yardage rather recklessly, there were times when there seemed to be no market at all. Moreover a large section of the dress trade was "between colors" and everyone was feeling for a trend in prints.

The independent converter wasn't the only one baffled by the low visibility of trading. Market chit-chat has often referred to recent reports of warehouse purchases by integrations. Such reports might mean that the integrations were letting gray goods accumulate while waiting for finished goods buying to revive. If so, one would have to admire the policy as a large-scale demonstration of steady nerves. Indeed, it is easy to see that every one in the business would be the loser if at such a time the integrations were to lose their grip.

At any rate, it wasn't altogether true that converting-trade initiative had temporarily dried up. We know of converters who put big money into the finishing of gray goods during November and December despite everything. With the secondary gray cloth market so wobbly, perhaps these people considered it no less risky to keep yardage moving into work. Anyway, *they* should be prepared for some of that over-due betterment in business we were talking about.

Until next time,

WILLIAM LAWRENCE

New Linear Polymer Research

KNOWLEDGE of linear polymers has now reached a stage of development which makes it easy to synthesize a new fiber-forming polymer, according to Dr. G. Preston Hoff, assistant manager of the Technical Division of the Du Pont Company's Rayon Department.

"The difficulty arises in finding a material with the right combination of properties to fill needs not satisfied by existing fibers," he continued, in an address on "Research and Synthetic Fibers" before the chemistry and chemical engineering faculty, students, and alumni of The Ohio State University.

His talk was made in connection with ceremonies marking the 75th anniversary of the establishment of the chemistry department at the university, from which Dr. Hoff received his doctor of philosophy degree in chemistry in 1925.

Dr. Hoff said that the matter-of-fact words in the title of his talk "all but conceal the drama of a great story of science and industry that almost perfectly reflects the partnership between university and industrial science. . . . I speak of the linkage between the men in their classrooms and laboratories, working under the guidance of wise teachers and in an atmosphere of academic freedom and adventure, and industrial chemists in free America beyond university campuses."

"When our company began rayon manufacture in 1921, there were only two rayon companies in the United States. They employed but a few thousand people. Today no less than 15 rayon-producing companies directly employ 67,000. They serve approximately 150 weaving mills, employing another 112,000. The industry includes 575 rayon converters, mostly small concerns, and 585 dyeing and finishing firms. About 3500 companies make rayon cloth into finished garments sold through some 9,000 retail outlets. It all adds up to an industry of more than 13,000 separate business enterprises with a total of one and a quarter million workers."

"I sometimes wonder," Dr. Hoff continued, "if in the patient accumulation of knowledge, it could be possible that we may be working by evolutionary processes toward a time when there will always be work for men who want it. Certainly we can say that chemists in their laboratories have provided steady work to countless thousands of men outside the laboratories. For there can be no question but that the American textile revolution was given its vital spark, its driving force, by research."

Dr. HOFF emphasized that industrial research does not end with the discovery of a new product. "Nearly always, much more time and money are spent in finding a way to make the product at a suitable price level —and in improving the quality—than was spent in discovering the product.

"Among the beneficiaries of this kind of research are men to whom the new product gives employment, since process development and constant process improvement raise worker productivity, which in turn is reflected in higher wages. The function of research in making the individual worker more productive may be illustrated from the experience with synthetic fibers. For some of these, the production of one man-hour is equivalent to the output from between 65 and 100 man-hours in the silk industry."

He pointed out that the diverse scientific knowledge which made possible today's synthetic fiber industry came from scientists in virtually every corner of the world. "This demonstrates with abundant clarity," he said, "a truth which many who are not scientists sometimes overlook; namely, that scientific isolationism is as outmoded as political isolationism.

"If we but stop and look about us, we will see evidence on every hand of a close relationship between the rate of scientific discovery and development and the freedom with which scientific information may be exchanged among scientists throughout the world. . . . All phases of scientific learning are interdependent. . . . Truly a finding in one field provides the key to a secret in another."

TRACING the development of nylon and the more recently announced "Orlon" acrylic fiber,* Dr. Hoff said that "the concept of truly synthetic fiber-forming polymers was slow in developing, and it is upon this concept," he pointed out, "that the new science of synthetic fibers is based. It took a genius with a mind free of preconceptions, to show the way. These requirements were supplied," the speaker continued, "by the late Dr. Wallace Hume Carothers who directed the research which led to the development of nylon."

Speaking of new synthetic fibers, Dr. Hoff said that "Orlon," which was announced by Du Pont a few weeks ago, "makes available to the textile industry a synthetic fiber with a new set of characteristics. It possesses a combination of properties which make it useful for many purposes for which we would not recommend either nylon or rayon. For one thing, its resistance to sunlight makes it the best fiber we know of, natural or synthetic, for use in outdoor fabrics. In addition, its chemical resistance recommends it for filter fabrics and for the bags used in the collection of hot dusts. It may have a place in the collection of fly-ash from factory chimneys."

"AMERICAN industry needs both large and small business enterprises. There are many jobs which can be done to advantage by small business—including even one-man enterprises—but only large concerns could have afforded the research expenditures and plant investment that were needed to build up the American synthetic fiber industry," he concluded.

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* *See* AMERICAN DYESTUFF REPORTER *for December 27, 1948. Editor.*

Robert L. Huffines

The Significance of the Growing Synthetic Textile Industry

This talk was made by Robert L. Huffines, Jr., President of Burlington Mills Corporation, (N. Y.), before the Lowell Textile Institute last month.—Editor.

IN THE brief span of thirty-five years, the synthetic industry is the one in the textile field that has shown the greatest expansion; one which has produced the most significant new developments, and one which has risen to a dominant position in the textile world—outweighing all other textile fibers used in America put together, except for cotton. It is hard for me to imagine our everyday life without synthetics for they are literally woven into every phase of it from all types of apparel and household products to automobile upholstery and tires.

First, a few figures, which to me portray the rapid growth of the synthetics industry in this country:

This past year marked a significant milestone in the synthetic yarn industry, for production reached one billion pounds—which is a lot of fiber. Production in 1928 was 100,000,000 pounds; in 1936 the figure was 300,000,000 pounds, and in 1942 it hit 700,000,000 pounds. Now, the United States' output has passed the billion mark, and is continuing to grow. While this rapidly expanding production has been primarily in the rayon field, consumption of synthetic fibers other than rayon has also been on the rise for the past several years. Department of Agriculture figures show the output rise in this category in 1940 was 4,471,000 pounds; in 1944 it was 47,368,000 pounds, and in 1946 it was 53,329,000 pounds, with the same increasing trend occurring in 1947 and this year. The trend here, as with rayon, is definitely toward greater volume.

In 1937 synthetics, according to Government statistics, represented 9 per cent of the total broad woven goods output in this country. In 1941, it was 13 per cent. And in 1947, it was 16 per cent, with a further increase certain for this year. The production of rayon, nylon, and related synthetic fabrics in the January-March quarterly period this year reached a new record rate of 560,000,000 yards, thereby exceeding first quarter output of 1947 by 15 per cent, and the average quarter in 1939 by over 50 per cent. Surely, these two different sets of figures, one on yarn and other on fabric output, are sufficient evidence of the position that synthetics are rapidly assuming in the textile world.

WHAT are some of the factors that have contributed to the growth of synthetics? There are many, but I just

want to mention three which to my mind have aided materially the rise to prominence of synthetics in our textile world of today.

First is controllability of product. Synthetics, being man-made, can be controlled and adapted to virtually any specific end-uses for which they are selected. The fiber can be controlled; the resulting fabric can be controlled. When rayon was first introduced into this market a little more than thirty-five years ago, its quality was not too good. Most of it was of the heavier denier yarns which generally were not suitable for apparel uses. But by continuing research and experiment, and because of the chemists' ability to control the raw materials which made up the yarn, improved quality resulted and finer denier yarns were produced which established rayon in the apparel and household fields. It is this controllability of fiber and yarn that have aided materially the synthetic industry in producing many new, interesting and different developments in the textile field.

Second is stability of price. One of the prime reasons for the growth of the synthetics industry has been the relative stability of price of the basic fiber and yarn. This price point is important. The over-all trend of rayon prices, as with the natural fiber prices, from 1920 to 1932, was downward. Beginning in 1933 and continuing generally through 1941, the prices of our natural fibers moved upward, while rayon staple and filament rayon prices were continuing their downward trend. From 1938 to 1941, both staple and filament prices remained on a definitely even staple keel. Rayon prices during the war, as with wool, were on a control basis and thus remained at 1941 levels. Raw cotton, being uncontrolled, moved up. Since the termination of price ceilings near the end of 1946, rayon yarn prices, due to increased labor and raw materials costs, have been raised three times. But even with these three general increases, the current price of filament yarn is below the 1931 level, while staple fiber is under the 1933 level.

In comparison, the price of raw cotton is about four times the 1933 average and raw wool is approximatly double its 1933 average. This same pattern has been followed in fabric prices.

In this connection, it is well to point out that synthetics generally are not subject to or dependent upon many of the outside conditions that natural fibers are subject to. Influences such as large or poor crops, heavy or light imports do not generally affect the synthetics market. Thus, fluctuations are less frequent — which makes for a definitely more stable price and market.

Third, is the ability of the synthetics industry to produce new and interesting products. It is an industry that has built itself on producing, through constant research and equipment, new and improved products for the consumer at better values than he had ever before been given. It is the new or improved things that sell. This has been not only true of rayon, but is also true of many other synthetics. I am sure you all know the story of nylon. Now, du Pont has developed another new fiber called "Orlon" which shows definite promise. Union Carbide and Chemical are working with Vinyon N — another new fiber. There are many more. Further, synthetics are serving as the common denominator in the textile field — being used in combination with our natural fibers, wool and cotton, to produce new and different fabrics.

LET me cite a few examples from the Burlington scrapbook which substantiate this new development theory which is inherent throughout the history of the synthetics industry. Last summer, we produced new rayon suiting fabrics at very moderate prices with a clarity of pattern and coloring that surpassed many previous textile efforts. Next summer, you will see these new fabrics in men's clothing from coast to coast, in almost every type of make, and under almost every famous brand name and in less expensive stores. They will be in all manner of cut, make, and trim — and at all prices. We feel that they will serve as a boon to the men's clothing season next summer. These suiting fabrics did not just happen; they took years of research and experiment.

Developments in synthetic textiles are limitless. At Burlington, we are making cloths for the transportation field that have just come out of the test tube period. Looking at the automobiles of today, you will recognize that there is something functionally wrong with the upholstery. It is not only expensive, but it has a lot of defects. It soils easily, can't be readily cleaned, and is not adaptable for continuous movement. Normally, customers buy slip covers to cover a fabric that obviously isn't suitable, and pay twice for an article they should buy but once. Hence, these new man-made transportation fabrics — suitable for cars, airplanes, railroad cars, busses, and all other transportation uses — which eliminate these defects.

In the industrial field, we are constantly searching for new developments. Here is another one at Burlington which will illustrate hundreds of others. In every American city, there are hundreds of steam-pressing establishments which use machines where live steam at high temperatures pours through the present fabrics and rots them in a matter of weeks. We are producing synthetic fabrics that will wear for a matter of months under similar conditions. While they are comparatively high priced, there is a substantial saving in economy because of the wearing time element.

These are but a few of the new developments in synthetics that have been turned out by Burlington. We, naturally, are not alone in this field, for other companies in the synthetics textile industry are also experimenting to produce new things from man-made fibers.

WE HAVE reviewed briefly the growth of the industry and have shown that the tendency in all fields is toward greater volume. That synthetics will continue to grow in the over-all textile field appears certain. The points that synthetics are limited only by man's ingenuity, that they are fortunate enough to possess more stability of price and, finally and most important, that they provide the basis for innumerable new developments and end uses are sound proof for such a viewpoint. Our natural fibers have been with us a number of years and virtually all fields and developments in connection with them have already been explored.

The synthetic industry is the largest single industrial employer of manpower in the United States. Yet, in comparison with such professions as teaching and medicine, there is a definite lack of individuals being trained to come into the industry and further its advance in the world textile picture. The industry needs individuals who have had basic education in the textile field. It wants individuals who have a definite interest in making their career in the field, and who can contribute their knowledge and skill to its progress.

On the other hand, the synthetic industry is comparatively young and in a brief period has made tremendous strides. Yet, many new fields and uses for synthetics are still awaiting development. Just how far we can go is anybody's guess!

Eugene Messner Predicts . . .

Eugene Messner

ONE year ago, Eugene Messner, President of Loomskill Fabrics, Inc., and who during the war was director of the Consumer Goods Division of OPA, spoke before the Textile Chapter of the American Veterans Committee and foretold almost to the letter the conditions now existing in the textile world. Last month he presented, before the same group, his analysis of the present textile situation and his predictions for the coming year. Here, in somewhat summarized and expurgated form, is what Mr. Messner said.

"I don't think there is any doubt that the jag is over, but I don't think that we are going to have poor business in the United States. I think the textile industry is going to be hard hit. I think that whereas almost all industries have prospered in the past year, certainly the textile industry reaped enormous fortunes in practically all branches. It reaped at the yard level, it reaped at the mill level, and in many cases reaped most unfairly. You had your economic opportunism. People excused themselves for some of the prices they charged, but in some cases it was just legal robbery.

"I don't think there will be any legal robbery in the next 12 months. However, neither do I think that there will be an economic depression. I think we are coming into a very good overall year of business, but I think that in most branches of the textile industry, money will be lost.

"There are a few things that must be borne in mind. First of all we probably will have a minimum budget of $45,000,000,000. Beardsley Ruml predicts that it might be 50 billion dollars. A budget like that includes a lot of pump priming. It is pump priming in a new sense. But with a high budget and a high debt, we are not coming back to any 1939 prices, because if we did, labor would be squeezed and profits would be squeezed. Profits are going to stand a good deal of squeezing. Labor is not going to be behind the Eight Ball. I don't think that labor is going to go down. So probably the real wages of labor, for the first time, will be the same or slightly higher with all the advantages that labor has had in money. In addition to our budget, there are such terrific world needs.

"Last year in answer to the question about exports, it was some people's opinion that we were going to export a lot of goods. I ventured the prediction that exports would be cut in half and they were cut in half and textiles slightly more so. Exports are going to rise a little, and although they won't come back to anything like 1947, we will be doing a lot of exporting. The rest of the world needs a lot of machinery; the ferrous metal machinery is in great demand, and this is another reason why I think we are not coming into a depression. I think it is going to be hard in the textile industry, with most of the textile people being pretty well heeled. The big mills put aside a lot of money for contingencies. Most converters are much richer than they were seven years ago. There are not going to be many insolvencies in these industries. There will be a few insolvencies in a few people that we sell.

"Nourse, the Chairman of the President's Economic Advisory Commission, said that if we expend over 15 billion dollars in armaments, we would again be leading to inflation. Even that may not be correct. I think that in most industries, the deflationary problem is beginning to become a factor. There are a few things that are coming up, such as tax rebates of one billion dollars. Four states have given veterans a bonus. There is a very strong labor situation. There is also a terrific employment level.

"On the question of parity, parity prices work both ways. I think parity on cotton, something in which you fellows would be interested, is probably much too high. I think that the crop we have this year, would seek a much lower level if the parity was lower.

"In textiles, I think there is an oversupply, and I think it is more or less going to lead to 'give away prices.' On unwanted stuff there will be low prices, on union worn stuff, there will be reasonably firm prices, on wanted stuff, there will still be a high price. There is a lot of stuff that is no good, and it is going to go and it always should go.

"Unfortunately, there is not as much sanctity of contract as there should be. There is resentment by the converters against the mills, the retailers against the manufacturer, because rightly or wrongly, they ascribe profiteering to some people. There is not any feeling of loyalty on the part of many toward a contract. In many cases that feeling is not justified, but in many, unfortunately, it is, and so there *can* be a kind of chaos even on confirmed orders.

"Now within the textile picture, I think I would be most bearish on woolens. Wool prices are exceedingly high. Rayons are making greater encroachments on men's wear items, particularly on summer suits. The feeling of apprehension that most people have, and the drop that can take place in wool, is very frightening. When you fellows came back from the Army, there were 29 million suits a year being produced, and it was pretty hard to get a suit. But as I said a year ago, men's wear business was going to take a flop. It was so logical. You had all bought suits, shoes, overcoats, over a period of

a year and a quarter or a year and a half, and it seemed as if you were living in the best of all possible worlds. What people didn't seem to realize was, that after those things were bought, you had stocked up. They produced 16 million dozen shirts a year. Now shirts are being sold at less than the cost of production. You are seeing ads of $1.95 shirts. Well, even if they skimp, (and it can't be done with union labor, and there is practically no labor that is exploited in America today), they can't make it at that price. Every once in a while some Chain fellow puts the price down lower than the cost of production. I read about a fellow that had a meeting of the woolen people, and he told them that they had better learn something about the men's clothing business, that there will have to be very much better coordination between the mills and the mill's customers. That is something that has been sadly lacking, and a couple of firms have gone to the dogs as a result.

"I was in California last April, and the Los Angeles customers were in very bad shape. They had made their contracts with the converter outfits. Now the institutional houses and the wealthy houses had a certain amount of worry, but the little fellows in the $35,000 to $75,000 class, who had to anticipate and borrow toward it were really in terrible shape. There had been a drought, the moving picture industry was laying people off, especially after failing to get markets from England. And I was thinking when I left Los Angeles, that maybe we are in for a real depression in the rayon and textile fields, but that was a false impression. And as you got around to Dallas, St. Louis and Chicago your perspective returned to you. Last summer the season ended rather badly for most garment manufacturers, but they were able to sell their goods. Cotton ended strong, rayon ended weak, but because there was a group of manufacturers that had no standing with the converters and a group of mills. There was a group of manufacturers that was ready to absorb and overstock, and it was the salvation of the people.

"ANOTHER reason why things are not going to go to hell in the textile industry is that there has been a great feeling of caution for some time. Most people felt in the back of their minds, that we were going to have a flop. In June of 1947, it looked as if the flop was going to come, and just about that time, the Celanese strike came. In women's wear, there took place a new style, the new look, and there was the use of more yardage, and a great many durable industries were so far behind on their orders, that employment was tremendous, and the flop never happened, though as time went on, people began to feel immunized against this flop, and also in the meantime, some water began to be squeezed out of the very big profits. During all this time, costs were going up, so that if a mill was selling something out of range for 30 cents over a period of years, it was not so out-ranged. Rising costs made 26 cents a fair price.

"I think that the cotton goods have gone pretty much through the wringer. The quotation on cotton is very low. That does not mean it will go up, because the pendulum doesn't swing that way. If it does not stop there, it may go lower. I am not advising cotton goods as a good speculation, because the supply is too great. I think the general trend is pretty much all right, since it is better than in other goods.

"In the denim industry, the prices never went up as in some others; there never was a uniformity of getting away with murder. There was a certain amount of decent business all the time, and if the dominant houses in one branch were commission companies, in the denim industry, there were some good houses and some awfully bad ones.

"THERE are some others things that also enter the picture. There is the New England versus the South proposition. Very little of the South is unionized, and New England is very much unionized. I would say that New England may be working today at quite a disadvantage. Ghost towns have been made out of some of the New England textile towns, and when Senator Tobey tried to do something about the situation, I wrote to him telling him that I was glad to see that something was being attempted to alleviate the situation in this regard. I don't think that mills should become refugees to the Island of Porto Rico and escape organized labor. I think that a great many verticals that made double profits on the way up, are going to take a double loss on the way down. I think that verticalization is going to undergo a considerable diminution, because I think very few of the verticals built styling organizations that could cope with a normal or sub-normal market. Now I think it is going to be a normal, not a sub-normal, market. Lines that tended towards quality are going to constitute more of the business than is going to the mass lines. Chain stores may cut into department stores. Brand lines that didn't bastardize their products during the war, are going to do a better business than the fly-by-night houses.

"Some of the Textile schools are doing very good things, and some good people are going to come out of them, and the textile business is going to remain a great industry. I think there is going to be a walloping on the inventories, and I think that with comparatively full employment, we will see great prosperity in the country. And I think once the inventory wallop is taken, we are not going to be in bad shape.

"Rayon goods are too high. I mean that there is a cloth ceiling at 40 that is worth 27. There is not any uniformity to the inflation.

"THOSE are some of the main factors that I see. I think that styling is going to regain its importance and I think there is a fine future for people who know how to style. I think that selling is going to regain its importance. And, incidentally, I want to say that most selling is done very badly. I think the dissemination of panic on the part of producers to their customers on the question of bids, is a very bad thing in our industry. I think there is an awful lot to selling and I don't think there is anything very profound about it. I think it takes hard work. It takes a good house to sell for, because if you have a lousy product, you can't be good for more than a year at that normal market. You can't be better than what you have to sell. I don't think that the selling now is nearly as good as it used to be. I think it is due to the racketeer era we passed through. There was a lot of racketeering going on, and a lot of pople are tarred with the name of racketeer, but who are as decent as they ever were. Just the same it was a racketeering period. Very few people applied themselves to selling, very few to styling. I think we are coming back to a market where the alert people are going to make money.

"I think the wallop is still to be taken in rayon. I think there is an explosive quality in the woolen situation. It seems to me that the woolen people are going to take a wallop. Once the wallop is taken, I don't think business is going to be at all bad. If people just think that everything is lousy because profits are not normal, that is just human nature. I think that I have said enough."

Textile Apparel Industry, Quartermaster Corps Get Together

HIGH ranking Army officers discussed important roles of the Quartermaster Corps and the textile-apparel industry in national defense at a dinner given in their honor recently at the Hotel Astor, New York.

Featured speakers were Major General William Middleswart, Chief, Military Planning Division, Office of The Quartermaster General; Brigadier General L. O. Grice, Commanding The New York Quartermaster Purchasing Office; and Lt. Colonel H. O. McGillin, Military Planning Division, OQMG.

The "Year-End Textile-Garment Market Get-Together and Quartermaster Night" was sponsored by the Textile Square Club of New York. Harry Riemer, president of the club and editor of the *Daily News Record*, was toastmaster. Several hundred prominent officials of the various sections of the textile-apparel trades attended the dinner.

HIGH-LIGHTING the occasion was General Middleswart's talk on "Quartermaster Research and the Public Interest." The General called attention to the fact that aid of the nation's finest brains is being enlisted in the effort to provide the American soldier with the best food, clothing, and equipment that can possibly be developed.

Major General William Middleswart (left), and Brigadier General L. O. Grice, at the Year End Get-Together.

"In the event of another war," said General Middleswart, "a 'sneak attack' with atomic weapons might well result in the destruction of immense industrial areas and possibly millions of lives. It is therefore vital to national security that the fullest plans for industrial and military preparedness be made and executed in advance of such a contingency.

"Finding the right answers to our many research problems is a back-breaking job. It is taking the best thinking, the most arduous work, not only of the military, but also of top-notch scientists in leading universities throughout the country and in private industry," he said.

"The Quartermaster Corps," stated the General, "is applying data obtained from detailed measurements of 100,000 male and 10,000 female Army personnel in improving the fit of Army clothing and reducing waste by developing more efficient size groupings.

"Studies of body measurements with body photographs," explained General Middleswart, "indicate definite relationships between body types and the regions of origin, civilian occupation, education, national derivation, military occupation, and even the religion of the service men. The studies indicate a close relationship between body build and occupational aptitude which will provide valuable data upon which personnel may be more efficiently utilized in the National Military Establishment."

New Fire-Resistant Fabric May Replace Twill

AMONG research and development items described and demonstrated by General Middleswart during his talk was a new fire-resistant, longer wearing fabric which may replace herringbone twill for work and field clothing. This fabric, according to the General, has twice the wearing life of herringbone twill and, if it had been available during the war when twill was being bought at the rate of 300,000,000 yards a year, a saving of $100,000,000 a year could have been made. The new fabric employs a satin weave in which the filling floats take the wear, leaving the strength of the warp unimpaired.

Other new and improved QMC items demonstrated included lighter and warmer Arctic clothnig; a cotton sock with nylon reinforced toe and heel, expected to have double the wear of all-cotton socks; a shrink-resistant wool sock which shows no appreciable loss of size after 20 launderings; wool shirting similarly treated; trousers made of nylon-wool blend using shrink-resistant wool; plastic body armor which withstood the impact of .45 calibre revolver slugs: and many other items.

How and Why

BRIGADIER General L. O. Grice, Commanding, NYQMPO, discussed "The How and Why of Quartermaster Corps Procurement."

Pointing out that NYQMPO procurement during the fiscal year 1949 is running at a much heavier rate than in previous years, General Grice revealed the fact that the dollar value for the six months period alone, ending December 31, 1948, was approximately a quarter of a billion dollars!—a particularly revealing figure when compared with the average of the 1947-1948 fiscal years of about $267,000,000 annually.

"A large percentage of this amount," said the General, "is going into the purchase of textiles and clothing. A substantial sum is also being expended on supplies for foreign aid.

"Some two years ago," declared General Grice, "Major General T. B. Larkin, the Quartermaster General of the Army, initiated a strong and continuing policy looking to the establishment and maintenance of cordial and cooperative relations between industry and the Quartermaster Corps.

"The pace and success of our current procurement program proves the wisdom of that far-sighted policy. It is only by such wholehearted cooperation that procurement of such volume and range is made possible.

"It is apparent," concluded General Grice, "that many representatives of industry are confronted with numerous problems when selling supplies to the government. Complex situations also arise during the performance of contracts with government agencies.

"As a means of resolving such difficulties, we of the New York Quartermaster Purchasing Office will be very happy to have active and potential suppliers discuss their problems with us in detail.

"We have what we believe to be a well-rounded staff of highly trained accountants, attorneys, procurement specialists and administrators ready to do what they can to help solve such difficulties to the best interests of both industry and the government."

American Industry in the Atomic Age

"AMERICAN Industry—Atomic Age Militia" was the topic of the talk made by Lt. Colonel H. O. McGillin, Military Planning Division, OQMG. In discussing the importance to national security of the Quartermaster Corps industrial mobilization planning program, Colonel McGillin expressed the opinion that American industry must assume the role of "Atomic Age Militia" in support of trained military manpower.

"In the event of another world conflict we are no longer invulnerable to enemy attack," said Colonel McGillin. "The possibility of devastating air raids and of widespread sabotage cannot be ignored.

'Based on the strategic concepts of a future war as conceived by the Joint Chiefs of Staff," he continued, "we have calculated what the possible Armed Forces requirements of supplies and equipment might be. We are now engaged in a program of surveying industrial facilities which are believed capable of producing the most critical and essential items for Army use. Production studies are being instituted to determine the steps necessary to increase or to speed up such production so as to guarantee adequate support of full military mobilization should war again suddenly strike us."

HARRY RIEMER, writing in *Daily News Record* a day or two after the dinner, had the following pertinent comments to make: ". . . It was a privilege to hear this story direct from the officers who are in command of various operations. If possible, more people throughout the country should be given a similar opportunity.

"To know what the QM has done and is doing to overcome and master the terrors of the Arctic, is reassuring. . . . Thrills come to us in textiles and garments when we realize how big a part these industries play in the entire program. The Army has made great strides in arriving at the kind of raincoat fabric it has long sought—a fabric which permits body moisture to escape, and which is at the same time waterproof.

"Perspiration under raincoats, particularly when worn in the field was the bane of the soldier in World War II. Now, unless leakage through seams can be overcome completely, the objective is to eliminate seams.

"The last war has been called the 'herringbone war' — because 300,000-000 yards annually were bought by the Army. But the HBT was never popular with the soldier. Now the QM has a new fabric to replace it—of greater strength, whose use during the war could have saved about $1,000,000,-000, we are told.

"The use of nylon to reinforce cotton socks at the toe and heel, and nylon used in wool gloves, both promise to effect substantial savings because of increased strength.

"As is known, the QM has made important progress in coping with the problem of wool shrinkage in socks and in clothing."

Among Those Present . . .

AMONG companies represented at the dinner were the following: Cone Export & Commission Co., J. W. Valentine Co., American Woolen Co., A. M. Tenney Associations, Berkshire Fine Spinning Associates, J. P. Stevens & Co., Union Underwear Co., Botany Mills, Cluett, Peabody & Co., Greenwood Mills, Hendry Modell & Co., Deering Milliken & Co., Riegel Textile Co., Dan River Mills, Pepperell Mfg. Co., Goodall Sanford Co., Singer Sewing Machine Co., Talon, Inc., Sayles Finishing Plants, Inc., Crown Overall Co., Pacific Mills, Reliance Mfg. Co., Wellington Sears Co., McCampbell Co., Fox Knapp Mfg. Co., William Skinner & Son, Scovill Mfg. Co., Celanese Corp. of America, Turner Halsey Co., Ginsberg Machine Co., Lowenstein & Son, American Bleached Goods Co., Ciba Co., Inc.

Trade associations represented were as follows: Cotton-Textile Institute, Underwear Institute, National Knitted Outerwear Association, Association of Cotton Textile Merchants, National Association of Uniform Manufacturers, National Federation of Textiles, Philadelphia Textile Institute, National Association of Wool Manufacturers, Textile Fabric Association, National Association of Hosiery Manufacturers, Textile Distributors Institute, National Heavy Outerwear Association, National Federation of Finishers of Textile Fabrics, Silk & Rayon Printers & Dyers Association, Thread Institute.

Shine Eliminated from Textiles

A NEW PRODUCT IN THE FIELD OF DRY CLEANING AND TEXTILES will be introduced to the public by the Vitatex Products Corporation, RKO Building, New York City, under the name of "Killshine." Successfully tested and proved in several leading laboratories, "Killshine" reportedly not only removes shine from clothing but restores the cloth fibres to their original appearance by "waking up" the nap, and giving it lustre. "Killshine" bears the Good Housekeeping Guaranty Seal which was granted after extensive testing. It works on the same principle as cold permanent wave lotions, i.e., when "Killshine" is applied to the shiny area of a piece of material, its chemical action temporarily softens the tiny fibres which normally form the nap. While these fibres are in this pliable state, they are brought back to their original position by the brushing action used in the treatment, thus restoring the nap and killing the shine. "Killshine," in effect, gives a permanent wave to the tiny fibres that form the nap on most materials and in this way removes the unsightly shine. On fabrics that have no nap, shine is usually the result of a flattening of the fibres that make up the material. "Killshine" temporarily softens these fibres and the brushing action restores them to their original shape, thus killing the shine.

One of the laboratories, the first used in proving the merits of the fluid, reported that "Killshine" has no detrimental effect on color-fast materials. The chief chemist's report is quoted as follows:

"'Killshine' will remove shine from textiles. It gives fabrics new useful life and appearance. No shrinkage of appreciable amount resulted." He further declared that "Killshine" has no irritative effect upon the skin nor a retarding influence upon the healing of an open wound. It is non-inflammable, colorless and leaves no odor.

Among the articles of clothing tested were a pair of blue serge trousers showing a decided and unsightly shine in the seat and other areas. "Killshine" was used sparingly. No hard rubbing or mechanical devices were used. After the application, and while the material was still damp, a bristle brush was used to "wake up" the nap. When the area was dry, examination showed the treatment had removed the shine and it appeared to have restored the color of the material in the trousers almost to its original shade. No injury to cloth was found nor was a "ring" discoverable even though the test fabric was somewhat soiled before the "Killshine" was applied.

Other tests were made on rayons, gabardines, worsteds and cottons. Each fabric, after treatment, was reported free of undesirable shine.

Another test was made by creating an artificial shine on different types of material. These fabrics were cemented to steel wheels and were subjected to abrasion by allowing each wheel to revolve while a piece of sailcloth was held against it under tension. This process was continued for an hour and a half.

At the end of the artificial-shining run, each strip was removed and cut in half. One part was tested with "Killshine" and one part was retained as a control sample.

After the strips were satisfactorily "Killshined" and dry, they were again mount on the wheels and subjected to abrasion as before until it was judged the shine was equal to the control.

The results follow:

	Time of Original Shining	*Production of equal shine-treated fabric*
	Hours	Hours
Black wool	1½	1½
Lavender wool	1½	1¼
Medium blue cotton	1½	1½
Black rayon	1½	1½

This same test was repeated several times and the results were the same.

Last November, before "Killshine" was released to the public, the National Institute of Cleaning and Dyeing at Silver Springs, Md., the official spokesman for the nation's cleaning and dyeing industry had said:

"We have found no practical method of removing shine from garments under all conditions .The method which is commonly used, is spraying with water, followed by steaming, and also using some mechanical action either by rubbing or brushing. There are some companies who claim to have a process for shine removal, but we believe in most cases these processes involve the use of acid or some type of abrasion."

"Killshine," its inventors claim, does not contain harmful acids or abrasives.

Another test was made on a piece of new woolen goods. A piece of cloth was ironed without the use of a pressing cloth. A very shiny surface resulted. A half of this surface was treated with "Killshine" by using the jar cap applicator. Results were that the area was restored to its normal appearance.

"The treatment of worn textiles showed signs of a noticeable cleaning action. No shrinkage of appreciable amount resulted from the tests."

The fluid was checked on an electrometric device to determine the pH, and it was checked for acidity. The pH was reported essentially neutral and no evidence of acidity was discoverable, thus indicating that "Killshine" is free from any harmful acids or alkali.

The laboratory findings included the following:

"The treatment does not affect colors that are water-fast. The extent of shine removal depends on how severe a shine originally is present. The treatment freshens up color of old garments.

"The product can be used on woolen goods, many types of rayons and cottons."

"The method of application is simple and requires no special equipment and can be used by anyone. It is an aqueous solution, non-inflammable, non-explosive and not subject to rapid evaporation.

"Laboratories also made toxicity investigations on rabbits with samples of "Killshine." The object of these tests was to determine the effect of "Killshine" upon the epidermal layers of the skin, and upon surgical incisions, made in the area treated with the test material. There was no effect.

Fifty Years of Daytime Fashions

Erwin Feldman, Director Counsel for the National Association of House Dress Manufacturers.

"Token Picker"—one of the typical advance Spring daytime styles shown. Tiny golden keys dangle from the belt of this slick Trudy Hall design. Its mandarin collar, slashed under the chin, takes to scarves and such. The skirt, gored front and back, falls in easy, loose pleats. The sleeves are push-up length. This dress is spun of a crisp, crease-resistant gabardine in beige, toast, green and blue, and retails at $14.95.

In days of old . . . in 1898 *. . . when the house dress was a calico wrapper with matching cap, the daytime dress industry started. It has grown and flourished until today the National Association of House Dress Manufacturers with its* 75 *nationally advertised brand members is celebrating its golden anniversary as the oldest needletrade industry in America. Among their first was full and baggy dress, fit to be worn only in the privacy of one's own bedroom or sitting room. Quality, not fit, was the customers requirement.*

THE National Association of House Dress Manufacturers celebrated their Golden Anniversary on the evening of January 11 with a dinner-fashion show in the main ballroom of the Waldorf-Astoria.

Included among the special guests of honor were representatives of the retail and textile groups and the following officers of the association: President, A. H. Sincoff, Forest Manufacturing Co.; First Vice President, Emil Gottfried, The Gottfried Co.; Second Vice President, Stanley Glen, Rhea Manufacturing Co.; Secretary, Ted Cohen, Ted Cohen, Inc.; Treasurer, Bernard M. Polay, Samson, Polay and Goodman; Chairman Board of Directors, Charles Biberman, L'Aiglon Apparel, Inc.; and Director-Counsel, Erwin Feldman.

Mrs. Nelly Don Reed presented golden anniversary awards to the following of the 75 nationally advertised brand members who are also celebrating their 50 years in business: Barmon Brothers, Buffalo, N. Y.; Fashion Frocks, Cincinnati, Ohio; Isaac Ginsberg & Bros., Inc., N. Y.; N. L. Gross, Cleveland, Ohio; Hubrite Informal Frocks, Boston, Mass; L'Aiglon Apparel, Philadelphia, Pa.; N. J. Nalibotsky, Phila., Pa.; Reliance Manufacturing Co., Chicago, Ill.; Rice-Stix, St. Louis, Mo.; Sacson, Inc., Union City, N. J.

Mr. Erwin Feldman, in an introductory speech briefly traced the growth of this daytime dress industry, the oldest needletrade industry in America and one that is responsible for the introduction of the revolutionary "sectional sewing system" into the manufacture of dresses, also pointing out its start in 1898 as a 1 million dollar business which has grown and flourished into the 500 million dollar industry it is today.

A gay and amusing fashion show historically depicted with an animated sketch in ballet fashion, "Fifty Years of Daytime Fashions." Oldtime costumes of cotton calico were presented alongside their modern counterparts of magnificent cottons and rayons in the advance Spring and Summer fashions from the 44 exhibiting manufacturers.

New Services, Projects, Businesses

A NEW CONVERTING FIRM – has been formed by Herman L. Jarmel, formerly of Jarmel Frocks, Inc., to handle rayons, cottons and novelties for the medium and high priced dress trades, with offices at 140 West 38th Street, New York.

UNITED STATES TESTING COMPANY—Hoboken, N. J., has opened what they believe to be the first fully equipped, independent laboratory for the plastics industry. Equipment includes special air-conditioned rooms maintained at 77°F., and 50 per cent relative humidity, as well as low temperature cabinets, capable of holding material under test at —100°F. Fifty-ton compression molding presses also are available, as well as a 150,000 volt machine for dialectric strength tests and other electrical purposes. Other regular tests are available, such as ageing, abrasion, flexing, flammability, distortion, light transmission, color fastness, thermal conductivity and polariscopic examinations.

"THE TEXTILE MACHINE OF THE FUTURE—will be an all-purpose machine," Eugene C. Gwaltney, Vice-President of Saco-Lowell Shops, told the student body of Lowell Textile Institute recently, and predicted that in the future his company would equip textile mills rather than cotton or woolen mills. The mill of the future will have all-purpose machinery capable of handling almost any fiber of almost any length, said Mr. Gwaltney, and his company has already, in experimental mills use, a drafting unit capable of handling the drawing or spinning of any fiber from one inch to twelve inches.

FEDERATED DEPARTMENT STORES — recently announced the highest annual earnings in its history. Net profits, unaudited, after provision for LIFO and for Federal taxes on income were $12,704,830 for the year ended October 30, 1948, an increase of 23 per cent over the $10,297,428 for the 12 months ended November 1, 1947. The earnings were announced by Fred Lazarus, Jr., President of the Federated group which includes Bloomingdale Brothers of New York City, Abraham & Straus, Brooklyn, N. Y., Wm. Filene's Sons Co. of Boston, Foley's, Houston; Halliburton's Oklahoma City, F. & R. Lazarus, Columbus, and Shillito's, Cincinnati.

AN ADVERTISING PROGRAM FOR THE COMING YEAR—was outlined in a series of meetings held by the National Plastic Products Company, Odenton, Maryland, December 14th through 17th, 1948, at the Waldorf Astoria. Object of the meeting was to present to saran weavers the advertising campaigns on saran fabrics planned for 1949 by both National Plastic Products Company, extruders of saran monofilaments, and The Dow Chemical Company, makers of saran molding powders. Among the companies attending were: Bridgeport Fabrics, Inc.; Collins & Aikman; Chicopee Manufacturing Company of Georgia; Deering Milliken & Company; Hafner Associates, Inc.; Martin Brothers, Inc.; Martin Fabrics, Inc.; Newcastle Fabrics, Inc.; Plastic Weave Mills, Inc.; Shawmire Textile Company; Susquehanna Mills, Inc.; Swift Manufacturing Company; Wendell Plastic Fabrics Corporation and Wortendyke Manufacturing Company.

CHARGES BY UNION WITNESSES IN WASHINGTON—that the textile industry is curtailing production for the purpose of maintaining high price levels are completely without foundation, according to W. Ray Bell, president of The Association of Cotton Textile Merchants of New York. In a wire addressed to Senator Ralph Flanders (Vt.), chairman of the Joint Committee on the Economic Report, before whose committee witnesses were reported to have said the industry was cutting production instead of prices, Mr. Bell stated that "nothing could be farther from the truth, for the facts reveal exactly opposite experience." Contrary to claims made by union officials before the Joint Committee hearings and also on frequent occasions through other channels over the past six months, Government records of production and Government records of prices show that the former has risen and the latter have declined to the extent that "prices of virtually all basic cotton textiles now approximate final OPA ceilings," said Mr. Bell. Referring to trends in profits which misinformed persons have claimed the industry was attempting to protect by cutting production, Mr. Bell indicated that the decline in cotton textile prices together with successive wage advances for employes in the mills and the high government support price on raw cotton have forced a situation where "marginal mills today are faced with actual losses and effiicent plants look only for meager returns." Bureau of the Census figures on production of cotton textiles, Mr. Bell stated, completely demolish the argument that mills have curtailed, since for the first nine months of 1948 total yardage of cotton woven goods produced was 7,397 million linear yards, or 143 million linear yards greater than in 1947 which was the all-time record year for peacetime production. In the same nine months, production of rayon and other synthetic woven goods increased from 1,384 million yards to 1,625 million, an increase of 16 per cent. Not only was the total production of cotton woven fabrics increased, but production has risen most sharply in the major categories of goods which have been in greatest demand. Thus, the largest single major classification of cotton broad woven goods, namely print cloth yarn fabrics, has

showed an increase in output for the first nine months of the year of 223 million yards or almost 10 per cent from last year's peacetime records.

BOCON CHEMICAL CORPORATION—has announced the issuance of the first policy of its kind in the mothproofing industry, in that one of the larger insurance companies has just issued a policy backing the unconditional guarantee of the Bocon Chemical Corporation for all fabrics or garments carrying the Boconize button. This policy is an innovation since none like it has ever before been issued backing a permanent mothproofing compound to such an extent. Any garment or length of fabric is unconditionally guaranteed against moth or carpet-beetle larvae damage for a five-year period up to $500 regardless of dry-cleanings or soap-and-water washings, provided it carries the Boconize button. This button is made of stainless steel and riveted onto the finished garment indicating, with its identifying mark, the year in which the fabric was processed. In this way the length of time Boconize has been in the cloth can be determined in the event of a claim.

EXPANDED PLASTICS MANUFACTURING FACILITIES—have enabled Bakelite Corporation, a unit of Union Carbide and Carbon Corporation, to increase average productive capacity by approximately 50 to 60 per cent during 1948. Further increases in plastics producing facilities, most of which are already well under way, will be completed during 1949 as part of the most extensive plant expansion program in the corporation's 38-year-old history, according to a company statement.

BURLINGTON MILLS—shared the spotlights with co-stars Patricia Morison and Alfred Drake when the curtain went up December 30 on the new musical show "Kiss Me, Kate." Producers Arnold Satin-Subber and Lemuel Ayers, have selected Burlington fabrics and hosiery for all costumes in the show, which embraces both modern and period costumes. Burlington divisions which are cooperating are: Concordia-Gallia, Decorative Fabrics, Hosiery, Men's Outerwear, Men's Shirting, and Tricot. For the first time in theater history, one source is to furnish the fabrics and hosiery for a complete show. A souvenir program carries a special design story featuring Burlington products, and several retail stores are planning cooperative window displays to tie in with the show's costumes.

GREENWOOD MILLS—Greenwood, S. C., announces a modernization and expansion program that includes two new mills for the production of filament rayons, in addition to some $10,000,000 that, by spring, will have been spent since the end of the war in modernization of the three existing mills and villages. These three mills (Greenwood Plant, Mathews Plant, Ninety Six Cotton Mill) employ about 6,000 persons, about 60 per cent of whom are housed in the mill villages. 1,600 homes in the villages are rented to employees at 50 cents a room a week, making a monthly rental of $10/12 for a five or six room house. There are more than 700 houses in the Mathews Mill Village. These modern brick homes with hardwood floors, would cost an individual in Greenwood from $12,000 to $15,000 to build, and would rent at about $100 a month. There are free nurseries for all employees for the care of their children during working hours. Mr. James C. Self, president of Greenwood Mills, has built churches each for the Baptists and Methodists, the dominant religions, in each village. The Presbyterians are forming a church and Mr. Self has agreed to give them a church when they are organized. He is building at a cost of three million dollars a 179-bed hospital which will create a medical center for Greenwood and the surrounding country for a radius of 40 miles. All employees are furnished free laundry service with pick up and delivery. The garages which accompany most of the houses in the villages rent for 25 cents a week. The Harris plant now under construction, and which cost from three to four million dollars, is illustrated above, and will be completed in the fall of this year. It will contain more than 500 looms. It will probably be accompanied by a new village development. Following completion of the Harris plant, plans have been made for construction of a new filament box loom mill which will contain throwing and twisting equipment, and will cost from five to six million dollars.

R. H. MACY CO.—is launching a three-month advertising campaign to establish a permanent retail demand for cotton bag towels among housewives in the New York area, the National Cotton Council reports. When state health regulations were passed in early 1948 prohibiting use of second-hand bags in flour distribution from mill to bakery, a new retail business was created as bakers found a profitable outlet for their emptied cotton containers through bag converting companies to retailers. Sold at good salvage prices to bag processors, the flour sacks are converted into tea towels and offered at attractive retail prices. Heavy initial demand for the highly-absorbent converted flour sacks during preliminary test sales resulted in plans for an aggressive newspaper campaign which is expected to increase volume of sales to several million bags annually. Macy's announces that the bags will be assembled from bakeries in the New York area and will be processed by a Newark bag converting company. The cotton bag towels will be advertised at a special introductory rate.

Personnel

DR. ELVIN H. KILHEFFER—E. I. du Pont de Nemours & Co., Inc., was re-elected president of the Synthetic Organic Chemical Manufacturers Association at the group's 27th annual meeting last month. Other officers elected were: Dr. W. M. Billing, Hercules Powder Co., first vice-president; Dr. E. C. Kunz, Givaudan-Delawanna, Inc., second vice-president; Charles M. Richter, Pharma-Chemical Corp., treasurer.

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MONROE D. MEYERS—is forming his own business, which will be known as Mastex Fabrics Corp., with headquarters at 450 Seventh Avenue. Mr. Meyers was formerly manager of the men's wear department of Edwin E. Berliner & Co.

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HARRY E. SCHAEFER — has been named vice-president in charge of sales for Regency Fabrics Corp. He has been in the textile field for more than 30 years, associated with L. & E. Stirn, Concordia - Gallia, and Burlington Mills.

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JACOB GORDON and H. BLOTNICK—have formed Gabletex, Inc., with headquarters at 245 Fifth Avenue, and will handle a line of woolens, rayons and cottons for both domestic and export trades. Mr. Gordon was formerly director of Jacob Gordon, Ltd., London, and Mr. Blotnick was a member of Blotnick Export & Import Co. of New York.

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AUDREY LEVEY—has been appointed promotion manager for Dorset Fabrics, Inc., and will cover retail yard goods and the cutting-up trades. She was formerly with Modern Merchandising Bureau, Junior Bazaar Magazine, and Tobe & Associates.

FELIX LIPPMAN — has been appointed head of advertising and sales promotion for Wamsutta Mills, Airedale Worsted Mills, Inc., Lippitt Worsted Mills, Inc., and Crown Manufacturing Co., it has been announced by Joseph Axelrod, president of the four concerns. Mr. Lippmann was formerly assistant to the president of Ward Machine Co., Brockton, Mass. Before that he had been in charge of sales and advertising of Conmar Products, Inc., Newark, N. J., and also for Timely Clothes, Inc., Rochester, N. Y.

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LOUIS H. BRILL—has been appointed general manager in charge of sales of the coat and suit division of Wesley Simpson, Inc. He was formerly vice-president of E. S. Freneau & Co., Inc.

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RICHARD CHOPAK — has been named sales manager of the retail division of Dorset Fabrics, Inc., having resigned as president of Chalet Fabrics, Inc., to accept the post. He has been in the textile industry for 16 years, most of which time he was associated with Charmette Fabrics.

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LARUS R. BURGESS — has joined Cone Export & Commission Co., Inc. as assistant to Morris Gardner, head of the rayon division. Mr. Burgess will be in charge of styling. Prior to joining Cone, he was with Kanmack Textiles, Inc., Stonecutter Mills, Textron Inc., and Burlington Mills Corp.

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ISIDORE HOLDEN—has joined Belvedere Fabrics, Inc., as sales manager, and will cater to the cutting-up trade. He was formerly with Belding Heminway Corticelli Co., and prior to that was president of Topspun Hosiery, Inc. of New York and an official of the Cayuga Silk Corp.

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JANE GRAY — has been appointed fashion coordinator of Cohn-Hall-Marx Co., and will direct the Cohama fashion publicity and retail ready-to-wear promotions. Miss Gray was formerly west coast editor of *Vogue*.

ROBERT WESTAWAY — has been elected president of Oneida Bleachery, Inc. John S. Ragland was named treasurer, and F. J. McKenna and J. S. Thompson were elected to the Board. The action followed acceptance with regret of the resignation of A. F. Hobbs as director, president and treasurer, and of W. T. Jordan as director.

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MAJOR GENERAL CLIFFORD L. CORBIN, RETIRED—former assistant Quartermaster General of the U. S. Army, is now associated with J. P. Stevens & Co., Inc. in a consultant capacity. During World War II he was director of the Procurement Office of the Quartermaster General, and in that capacity was responsible for the purchasing of textiles, clothing, and other items.

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MORTON SAVELL—has resigned as Managing Director of the North American office of the International Wool Secretariat. W. Francis FitzGerald has been appointed Acting Managing Director in his place.

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FREDERICK L. BISSINGER — has been named vice-president in charge of research of Industrial Rayon Corporation.

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CHARLES EARLE—formerly of Pacific Mills worsted division, has joined Ames Textile Corp., where he will be in charge of all men's wear operations. Prior to joining Pacific Mills, he was head of the woolen department at Fieldcrest Mills.

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V. A. WIBBELSMAN—has been appointed manager of clothing sales for U. S. Rubber Company. In his new position he will be responsible for sale of waterproof sportswear and dress raincoats as well as an extensive line of rubber surface clothing for industrial, farm and many special groups. Mr. Wibbelsman has been with the rubber company in various sales positions since 1920.

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JOHN S. LAWRENCE — treasurer of Native Laces and Textiles, Inc., has been elected to the newly created additional office of Executive Vice-President of the company. He has been with the company for 23 years, having started as one of three employees. The company, together with its six affiliated mills, now employs 1500. Mr. Lawrence, now but 39 years old, became treasurer in 1935, and holds executive offices in all of the affiliated companies. At the same time, EDGAR K. MOSES has been

elected to the office of Vice-President in charge of sales for the same company, and continues to be a vice-president of the affiliated mill, H. & F. Binch, Inc., Glens Falls, N. Y. He has been with the company nine years.

CHARLES T. MENTZER, JR.—assistant manager of fine chemicals sales in the Du Pont Company's Organic Chemicals Department, has been named sales supervisor to the department's New York office. He has been with Du Pont since 1929.

DR. EDWARD C. KIRKPATRICK—has been appointed assistant director of the Chemical Division of the Du Pont Company's Ammonia Department, succeeding Dr. Robert L. Hershey, who recently became assistant general manager of the department.

Dr. Kirkpatrick, director of the nylon section of the department's Chemical Division since 1946, began working for Du Pont in 1934.

WILLIAM DENNIS — has been appointed sales manager of plain rayon fabrics of Cohama Fabrics Division of Cohn-Hall-Marx for the coat, suit and rainwear trades. He has been with the firm for the past 16 years.

JOHN W. EVANS—is joining Fox Wells & Co., Inc. to head sales service on rayon gray goods to converters who sell to the over-the-counter retail trade. He was formerly with American Bleached Goods Co. and J. Rosenholz & Co. He was manager of the silk and rayon converting department of Claflin's, Inc., and sales manager at Post & Sheldon and at C. K. Eagle & Co.

ROBERT T. STEVENS—chairman of the board of J. P. Stevens & Co., Inc., will be named shortly as over-all coordinator of textile industry mobilization planning under William H. Hoch, director of the Textiles and Fibers Division of the National Security Resources Board. It is understood that he will serve on a consultant basis and will devote a few days per week to helping the NSRB prepare the textile trades for a possible wartime emergency. During the last war Mr. Stevens was deputy director for purchases of the Procurement Division of the Office of the Quartermaster General.

WILLIAM R. DEDERT — has been appointed to the new post of general superintendent, Victor Chemical Works, Chicago. In this capacity he will be in charge of manufacturing operations at the Chicago Heights, Illinois and Nashville, Tennessee plants, and the company's newest plant at Morrisville, Pennsylvania. Homer B. Terry, formerly superintendent of the Nashville, Tennessee plant, succeeds Mr. Dedert as superintendent at the Chicago Heights plant. John A. Coben, previously general foreman at the Nashville plants, succeeds Mr. Terry as superintendent at Nashville.

PAOLINO GERLI—E. Gerli & Co., Inc., was elected president of the International Silk Guild, Inc., at the organization's annual meeting in December. R. D. Jenkins was elected vice-president, secretary and treasurer.

HAL M. CRANSTON—has been appointed comptroller of Owens-Corning Fiberglas Corporation.

He joined the Fiberglas Corporation at the time it was founded in 1938, as general supervisor of accounting. In 1943 he was appointed assistant treasurer and auditor.

JOHN E. BASSILL—has resigned as president of North American Rayon Corp. and American Bemberg Corp., effective March 1. Mr. Bassill has been president of the two rayon yarn producing companies since May, 1947, when he succeeded S. R. Fuller, Jr.

Prior to Joining North American Rayon and American Bemberg, Mr. Bassill had been with the former Tubize Rayon Corp. 26 years. He was president of Tubize for 14 years prior to its absorption by Celanese Corp. of America in 1946.

He was vice-president and director of Celanese Corp. of America and was the only official from Tubize to serve on the board of the successor firm following the merger.

Mr. Bassill joined Tubize Artificial Silk Co. of America in 1920. The company was merged with American Chatillon Corp. and Mr. Bassill became vice-president in charge of sales of Tubize Chatillon Corp. in March, 1930.

He later became vice-president and general manager and in May, 1932, was elected president, in which position he served until the merger with Celanese.

F. A. JENCKES — has been elected Vice President of Burlington Mills Corp. (N. Y.) and will continue in charge of coordinating the production of filament yarn fabrics. Mr. Jenckes joined Burlington Mills Corporation in 1945 as head of cotton yarn sales, and later was associated with the merchandising of rayon fabrics. He served as an officer in the U. S. Navy from 1942-1945. Prior to that Mr. Jenckes was in charge of the New York sales offices of Manville-Jenckes Corporation.

SHELDON VANVLIET — has joined Greenwood Mills, Inc., as rayon technician, and will be principally engaged in quality control of Greenwood's line of spun and filament rayon fabrics. Mr. VanVliet has been with Colonial Mills for the past 16 years, and previously was with Wellington Sears. Mr. Van Vliet, through his experience in filament rayons, will be associated closely in the expansion of Greenwood's production of these fabrics in the new Harris Plant of Greenwood Mills, to contain 500 of the latest type plain looms for weaving rayon fabrics, and now under construction near Greenwood, South Carolina.

JOHN A. SARGENT—has been elected executive vice president of Diamond Alkali Company, effective January 1. He advances to this new position from the post of vice president of finance, which he has held since May, 1947. He joined the company as its treasurer in September, 1946.

PAUL C. McMILLAN—has been appointed manager of the newly created San Francisco office of Monsanto Chemical Company's export sales department. Mr. McMillan, who has been located in the company's New York export sales office, opened the new location January 1.

GEORGE J. ALLES — has been appointed purchasing agent for American Viscose Corporation at its Philadelphia offices. He succeeds J. LeRoy Shade, whose continued illness has made it necessary for the corporation to grant him an extended leave of absence. After Mr. Shade's convalescence, it is expected he will continue his association with the corporation.

For the last two years, Mr. Alles has been manager of the corporation's Sylvania Division plant at Fredericksburg, Va. His connection with the company dates from 1938, when he joined the Sylvania Industrial Corporation as treasurer. In 1942 he was elected a director of Sylvania and continued in that status until the merging of that company with the American Viscose Corporation in 1946.

These are New...

A COURSE ON TEXTILE IDENTIFICATION, ANALYSIS, AND TESTING—will be added to the series of textile courses already being given at Fairleigh Dickinson College, Rutherford, N. J. Directing the course is Gordon R. Turner, River Edge, N. J., who formerly taught the course at Columbia University. Mr. Turner is a graduate of the New Bedford Textile Institute. He is director of the Textile Testing Laboratories of the United States Testing Co., Inc. and a member of Phi Psi, professional textile fraternity, and the American Society for Testing Materials. At present the following courses in the textile curriculum are being given: Raw Materials, by Dr. Mauersberger; Textile Chemistry, by Mr. Minoff; Dyeing and Printing, by Mr. Decnyf; Finishing, by Dr. Pagerie; and Identification and Testing, beginning February 2, by Mr. Turner. Mr. Richardson will take over the second part of the course on Printing and Dyeing.

BUILT TO LEAK—is the new drain-bottom hand truck carrying wet cloth around textile mills and bleacheries. Lengthwise slots along the truck's sides drain off excess fluids. Adherent dyes and other materials are easily flushed out. The manufacturer, Lewis-Shephard Products, Inc., Watertown, Mass., makes the truck bodies of stainless steel to withstand hard usage and corrosive chemicals.

"A PERMANENT STARCH"—that keeps clothes crisp, it is claimed, through eight to ten launderings and also makes cottons wear twice as long, has been introduced to the housewife by Perma Starch, Inc. Devised primarily to eliminate the weekly starching chore for 30,000,000 women, this milk-like plastic has proved it can also double the life of dresses and blouses, children's clothes, men's shirts, curtains, sheets and tablecloths, said Perry V. Eakin, senior partner of the company. It resists wilting of clothes in humid weather and retards fading and mildewing, he stated. The major ingredient of the material is a synthetic resin developed by United States Rubber Company. Composed of colorless plastic particles fine enough to penetrate the inner fibers of cotton threads, the material was said to leave no streaks or blotches even on black fabrics. It stays in the cloth because the plastic particles, when heated by ironing, melt around the thread fibers, swell and solidify, imbedding and holding the fibers in place, it was explained. Mr. Eakin estimated nearly a million dollars had been spent on the 14-year quest for a permanent starch for home use. The problem was finally licked, he stated, by the combined talents of his organization and U. S. Rubber. Working together, a liquid plastic called Kandar, developed by the rubber company for textile mill use, was improved and other necessary ingredients were added. "The greatly improved wear came as a surprise bonus," said Mr. Eakin. "We could hardly believe our own first test results when they showed a several-fold increase in garment life. But independent research organizations have confirmed our results, making us feel our claim of doubled life is conservative."

CURTAIN FABRICS WOVEN OF FIBERGLAS YARNS—enter into the home-use field with the announcement that sheer Coronized Fiberglas marquisette curtains will be available in retail stores throughout the country by early spring. The Fiberglas marquisettes can be hand or machine washed, and can be re-hung, while still damp, without ironing or stretching. Because the glass yarns shed dirt, the curtains will stay clean for unusually long periods. They will take approximately 30 washings without breakdown, slippage or color loss, and without losing their "new" look, according to Owens-Corning Fiberglas Corp.

BURLINGTON MILLS—is introducing "Por-O-Paca," a new BUR-MIL acetate and viscose alpaca-type fabric which is being merchandised to the dress trade by the Duplex Division. First colors for early production are beige, cocoa, oxford, navy, black and white. "Por-O-Paca" has been processed, tested and approved for wrinkle resistance and color fastness under all normal wearing and cleansing conditions. It is designed for general and travel use, and will be cut in one- and two-piece fashions by leading manufacturers for Spring delivery to stores.

KING GUSTAF OF SWEDEN—who is an expert needle craftsman, working from July to October last year has embroidered an altar cloth for the Bethlehem Evangelical Lutheran Church in Brooklyn in connection with its 75th anniversary. As soon as it is packed for shipment, it will be flown by Scandinavian Airlines to the Swedish Consulate General in New York, where it will be formally presented to the Rev. Martin Luther Cornell, pastor of the Brooklyn Church, which is located at 490 Pacific Street. The cloth, or "antependium," has been embroidered by the 90-year monarch in a dozen colors, and has been composed by Martha Gahn, noted textile artist. Pastor Cornell has declared that a special tribute will be paid King Gustaf when the church observes its anniversary early this coming spring. The King has earlier donated altar cloths, which he himself has made, to six churches in Europe. In February last year, the monarch gave one to the First Evangelical Lutheran Church in Worcester, Mass.

MATTRESS COVERS DESIGNED BY ELSA SCHIAPARELLI — famed Paris colorist and fashion creator, are being introduced by the Sealy Tuftless Mattress Co. of Chicago this month, with an eye to creating a "new look" for 1949 selling in a field where promotional features heretofore were strictly limited. Sealy will offer Schiaparelli designed mattresses at $49.50 to $69.50 retail. According to the company, they represent a "contribution to fabric design never before seen in this country."

TRADE NOTES • NEW PRODUCTS

• Tennessee Eastman Representative

Announcement has been made of the December 1st appointment of a Cleveland representative for Tennessee Eastman Corporation's chemicals. The new representative, D. B. Campbell, Jr., has opened an office on the 16th floor of the Terminal Tower Building in Cleveland, from which he will solicit sales of Tennessee Eastman chemicals from the Ohio area in general.

Mr. Campbell has been associated with Tennessee Eastman Corporation at the plant in Kingsport, Tennessee, since January, 1948. He is a graduate of Emory University in Atlanta, Georgia, from which he holds a Master's Degree in chemistry.

• Gurley Dealer Appointment

Continuing its policy of new dealer activation, W. & L. E. Gurley, Troy, N. Y., manufacturer of engineering and scientific instruments, has appointed A. Lietz Company, with principal offices in Los Angeles and San Francisco, sales agent for Gurley equipment in California, Oregon, Nevada, Arizona, New Mexico, and El Paso, Texas, it was announced by Lester C. Higbee, Gurley General Sales Manager.

Coincident with the appointment, the Lietz Company has discontinued manufacture of its own line of surveying instruments, started in 1882.

Final arrangements were concluded at conferences between Mr. Higbee and Lietz sales representatives in San Francisco and Los Angeles, following the International Blueprint Association Convention in San Francisco, October 22-24.

W. & L. E. Gurley, founded in 1845, is one of the oldest manufacturers of engineering and scientific instruments in the United States. Its equipment covers the fields of surveying, goedesy, meteorclogy, paper and textile testing, and standard weights and measures.

• DCAT Committee Chairmen

Robert B. Magnus (Vice President, Magnus, Mabee & Reynard, Inc.) Chairman, DCAT (Drug, Chemical and Allied Trades Section), has announced the following chairmen to head committees for the 1948-49 fiscal year: *Arbitration*—J. P. Remensnyder (Heyden Chemical Corp.); *Auditing*—Russel J. Fosbinder (Maltbie Chemical Co.); *Bulletin*—Stanley I. Clark (Sterling Drug Co.); *Coordination* (Program for unification of drug laws)—Carle M. Bieglow (Calco Chem. Div., American Cyanamid Co.); *Finance*—Hugh S. Crosson (McKesson & Robbins, Inc.); *Legislative*—Carl M. Anderson (Merck & Co., Inc.); *Membership*—Chas. M. Macauley (Pro-phy-lac-tic Brush Co.); *Public Relations*—Harold C. Green (L. Sonneborn Sons, Inc.); *Section Activities*—Lloyd I. Volckening (The Ivers-Lee Co.); *Tares*—Jas. G. Flanagan (S. B. Penick & Co.)

Also, vice-chairmen as follows: Membership—Claude A. Hanford (Pharmaco, Inc.); Public Relations—Chas. P. Walker, Jr., (The Citro Chemical Co.).

• Tickets for Wet Processing Exhibition

Tickets for the Textile Wet Processing Industries Exposition to be held during the week of March 21st, Monday through Friday, at the 71st Regiment Armory, 34th Street and Park Avenue, New York, are available from the AMERICAN DYESTUFF REPORTER.

Persons engaged in the textile wet processing field may obtain these tickets without charge. Send your requests for as many tickets as are needed to the REPORTER at One Madison Avenue, New York 10, N. Y.

Firms interested in exhibition space may obtain further information from the office of Exposition for Trades, Inc., 36 West 47th Street, New York.

• General Releases

General Dyestuff Corp., 435 Hudson Street, New York 14, N. Y., announces release of circulars describing the following products:

Diamond Black FA-CF—a mordant dyestuff producing full jet shades of black said to possess good all-round fastness properties. It is largely used to dye inexpensive deep black shades on yarn, slubbing and loose wool when required to be fast to bleeding against cotton or rayon. It can also be used on piece goods.

It is stated that it is General's most suitable black when dyeings must be made in equipment containing iron. It is further stated that, since the solubility of the product is very good, dyeings can be carried out in pressure machines with short liquor ratios. *Circular G-544.*

Diazo Indigo Blue BRRA Conc. CF—a homogeneous dyestuff which produces fairly bright reddish navy blues on cotton, rayon and other cellulosic fibers. It is used for dyeing blues or navys requiring fairly good fastness to washing, and good fastness to water, perspiration and light. The light fastness is said to be good on cotton and very good on rayon, the wash fastness moderate to fairly good on cotton and fairly good on rayon. It is stated that aftertreatment with resin finishes for anti-crease effects does not affect the light fastness and increases the fastness to washing distinctly. It exhausts at a medium rate both at the boil and at 150° F. and levels very well when drawing on to the fiber. Acetate effects are slightly stained and animal fibers and nylon stained considerably. It is said to be sufficiently free from copper and manganese to be suitable for the dyeing of material to be rubberized. It is non-dusting. Dyeings are dischargeable to a white. *Circular G-546.*

Diazo Orange LGA Conc. CF—a new homogeneous dyestuff which is suitable for the dyeing of cotton, rayon and other cellulosic fibers in their various forms. When diazotized and developed with Developer AMS or beta naphthol, it produces fairly bright shades of reddish orange said to possess moderate to fairly good fastness to washing on cotton and rayon. It is stated that the light fastness is fairly good on cotton and good on rayon. Aftertreatment with urea-formaldehyde or melamine anticrease finishes has no apparent effect on the light fastness and distinctly improves the wash fastness.

It exhausts well both at the boil and at 150° F. at a moderately rapid rate and levels well once it has drawn on to the fiber. Acetate rayon effects are stained considerably and animal fibers and nylon dyed. It is supplied in non-dusting form. It is soluble at the rate of 1.5 ounces per gallon at 120° F. and said to be sufficiently free from copper and manganese to be suitable for the dyeing of material to be rubberized. Dyeings are dischargeable to a white. *Circular G-547.*

Fast Orange Salt RDN—soluble in water and couples directly with naphtholates to form insoluble naphthol colors. It principally yields reddish orange shades with most naphthols. On grounds prepared with Naphtol AS-LB and AS-DB, brown shades are obtained. Combinations shown in the circular are said to possess very good to excellent fastness to light, very good fastness to washing, fairly good to very good fastness to chlorine

and fairly good to very good fastness to hot pressing. It is sufficiently soluble (2 lbs. per gallon) to be applicable in all types of dyeing equipment. When printed on Naphtol AS prepared material, it produces bright reddish-orange shades said to possess very good fastness to light, good fastness to washing, fairly good fastness to chlorine and good fastness to hot pressing. It possesses good solubility and stability in the print paste. It should be stored in covered containers away from excessive heat and humidity. *Circular G-551.*

Rapidogen Red IGG*—(Patented)—an azoic compound soluble in caustic soda which, after printing and acid ageing, develops in the form of an insoluble dyestuff which is said to have superior wet fastness properties and very good fastness to light. When printed in the usual manner for Rapidogens on cotton or rayon, it produces bright bluish reds and pinks said to be of very good fastness to light and washing and good fastness to hot pressing and overprinting with caustic soda. It is stated that the light fastness is exceptionally good, much superior to the ordinary Rapidogen red types, and even in light shades it rates good to very good. It has good solubility when dissolved with the requisite amount of alkali, producing print pastes with good stability. It develops in acid ageing within three to five minutes. When dissolved with Developer Base RPN in place of caustic soda, developing may be carried out in neutral ageing in the case of light prints. Heavy prints require the acid ageing. *Circular G-554.*

* Reg. U. S. Pat. Off.

• Apex Chemical Dinner

On the night of December 18th, the Apex Chemical Co. Inc. tendered a dinner to 50 of its key employees at the Hotel New Yorker, to celebrate the 90th birthday of its founder and Treasurer, Hugo Helburn, also to dedicate the completion of a new addition to its manufacturing facilities at a cost of about $100,000. Mr. Helburn was presented with an automobile.

• Atlas Alkali-Stable Emulsifiers

Atlas Powder Company is announcing two new surface active agents under the trade name Brij. They are intended for use in emulsifying or wetting where stability to high alkalinity or acidity is of primary importance. Samples and commercial quantities are available.

Both products are polyoxyethylene lauryl alcohols. Brij 30 is generally water dispersible and oil soluble, being slightly more hydrophilic than Span 20 (sorbitan monolaurate). Brij 35 is water soluble, and compares in hydrophilic characteristics to Tween 20 (polyoxyethylene monolaurate). The Span and Tween products are trade-marked materials of Atlas Powder Company.

The following are general characteristics of the Brij products:

	Brij 30	Brij 35
Form at 250° C.	Oily Liquid	Waxy Solid
Viscosity (cp. at 250° C.)	25-125	.....
Titer (°C.)	.....	35-36
Specific Gravity	0.92-0.98	1.18-1.22
Color	Lemon	White

• James Allen Retires

James Irving Allen (above), who for many years represented American Cyanamid Company in New England for products distributed to the tanning and textile fields, retired on December 31st.

Mr. Allen was associated with the Newbert Color Company at the time this concern was acquired by A. Klipstein & Company. Klipstein was subsequently merged with American Cyanamid and during all this time Mr. Allen called on the tanning and textile industry. Mr. Allen's wide knowledge of the fields to which he devoted his career will be greatly missed by his many friends in New England.

• Joins Cleaning and Dyeing Institute

Dr. Dorothy Siegert Lyle has joined the staff of the National Institute of Cleaning and Dyeing, Silver Spring, Maryland. She comes to the Institute from the Ohio State University where she was an Associate Professor in the Textile and Clothing Division and also in charge of research for the Ohio State Association of Dyers and Cleaners.

Dr. Lyle spent two years in Toledo, Ohio where she was an instructor in textile science and merchandise, and also acted as textile consultant for the Canaan Drycleaning Company of that city. From here she went to the Pennsplvania State College where she was instructor of textile research and senior member of the American Viscose Corporation Fellowship at the Ellen H. Richards Institute. She left in 1946 to go to the Ohio State University.

At the National Institute of Cleaning and Dyeing Dr. Lyle will initiate and carry on a consumer education program designed to educate customers of member plants and the general public regarding the cleaning and dyeing industry. Particular emphasis will be placed on providing material for home economists, schools, women's clubs and other interested consumer groups.

• New Extractor for Raw Stock

Fletcher Works, Glenwood Ave. & Second St., Philadelphia 40, has developed an improved method of extracting cotton and wool raw stock and similar materials. This involves the use of a new "Twintainer" model extractor, with removable twin-containers which have hinged bottom sections for easy discharge of the material.

The containers, which are mounted on roller bearing casters, are usually loaded next to the cheese, then wheeled or carried on a monorail to the extractor. In-

Fletcher "Twintainer" Model Extractor

sertion and removal of the containers from the machine is said to take but a minute or two, thus minimizing the extractor's idle time, and enabling it to function productively for 80 to 90 percent of the time.

It is claimed that labor savings are very real with this new system. In one Southern cotton mill, two men per shift are said to have been eliminated by the installation of a Fletcher "Twintainter" which replaced three large conventional extractors.

Another advantage of this extractor is said to be the increased dryness of the extracted raw stock. It is stated that the moisture remaining is only about 34% on the dry basis.

The "Twintainter" is available in 50" and 54" sizes, having batch capacities of 320 and 400 pounds respectively. It is claimed that four to five loads per hour can be obtained quite easily.

• New Junior Walton Humidifier

The Abbeon Supply Company, 58-10 41st Drive, Woodside, New York City, distributors for the Walton Laboratories, Inc. announces that the New "Junior Walton" size humidifier is now in production after a series of intensive field tests.

The new humidifier is designed to round out the line of Walton Humidifiers by fulfilling the need for a humidifier to take care of medium sized areas.. It is designed to service the medium sized areas too large for the small units, except in multiples and too costly for the large Industrial size. It is stated that it requires no steam, no pumps, no compressors, and no return lines. They are said to be completely noiseless in operation. The vapor is emitted looking like a fog, finer than cigarette smoke.

Literature is available upon request.

• Foundation Opens Third Campaign

New England Textile Foundation, 68 South Main Street, Providence, R. I. announces that its Third Annual Campaign to raise $250,000.00 for the four textile schools in New England has officially opened. E. Dean Walen, Vice President of Pacific Mills, Worsted Division, Lawrence, Massachusetts is General Chairman.

Initial gifts total $54,500.00 and include one contribution of $30,000.00 from a company owning a chain of mills in Ned England.

In its Annual Report, the Foundation stated that its Second Campaign, which ended last July, was successful, raising $253,890.00 and that more than $245,000.00 of this amount had already been made available to the textile schools for modernization of equipment, faculty aid and scholarships.

The present fund raising campaign will last through July of next year, or until the required amount of money is raised. Textile mills, textile selling houses, converters, wool dealers, yarn dealers, cotton brokers, rayon manufacturers, dyestuff and chemical manufacturers, and textile equipment manufacturers and dealers will be solicited.

• Maneely Chemical Sales Manager

Maneely Chemical Company which opened a new $500,000 plant in Wheatland, Pa., on January 1st, has appointed William J. Nolan (above) Sales Manager. Maneely Chemical Company is a subsidiary of Wheatland Tube Company and has been formed to produce zinc chloride, zinc sulfate and ferric oxide. It is stated that the Maneely plant is modern in every detail, the newest in its field.

Since graduating from Notre Dame, Mr. Nolan has worked for such firms as Grasselli, the General Dyestuff Corporation, Ellis Jackson and Company, Glidden Company, in their Chemical and Pigments Division, and for the past 12 years he has had his own Chemical Brokerage business. Mr. Nolan is a member of the Chemists' Club of New York, the Philadelphia Chemical Club and the Whitemarsh Valley Country Club.

• Symposium on Spectroscopic Light Sources

This symposium was presented at the 1946 Annual Meeting of the American Society for Testing Materials by Committee E-2 on Spectrographic Analysis.

The four formal papers contained in this Symposium are as follows: "The Present Status of Excitation in Spectrographic Analysis"—B. F. Scribner, National Bureau of Standards; "A Study of the Controlled Spectrographic Spark Source"—J. H. Enns and R. A. Wolfe, University of Michigan; "Some Properties of Gas Discharges Used as Spectral Sources"—R. C. Mason, Westinghouse Research Laboratories; "Short-Period Phenomena in Light Sources"—G. H. Dieke, The Johns Hopkins University.

In addition to these four papers there are extensive discussions prepared by experts in this field.

Copies of this 80-page publication, in heavy paper cover, can be procured from A.S.T.M. Headquarters, 1916 Race St., Philadelphia 3, Pa., at $2.00 per copy.

• Dry-Cleaning Detergent

A new dry-cleaning aid was announced recently by the Du Pont Company.

The new product, to be known by the trade-mark "Ovalclene", is a synthetic dry-cleaning detergent which was developed by the Electrochemicals Department after several years of research directed to finding a formula suitable in all types of dry-cleaning equipment. "Ovalclene" is a balanced detergent, compounded for systems using either synthetic or petroleum solvents.

Tests under actual service conditions are said to indicate that "Ovalclene" dry-cleaning detergent removes soil thoroughly and quickly at low cost. It is also said to be excellent for preliminary cleaning of spots on textiles.

• Hartofol C

A concentrated alkylated aromatic sulfonate, said to show nearly twice the wetting-out action possessed by the conventional alkylated aromatic sulfonates, is being marketed as Hartofol C by the Hart Products Corporation, 1440 Broadway, New York. Hartofol C, a liquid gel, is said to be stable to both organic and mineral acids as well as all alkalies. It is stated that it can satisfactorily be used in water of any hardness and in the presence of salts, soaps, emulsions, and the like. From an economy viewpoint, Hartofol C is claimed to be one of the fastest wetting agents on the market. In addition to its wetting action, it is said to show good detergency (particularly in the presence of alkalies and phosphates) and good sudsing action. Hartofol C is intended to be used wherever its wetting-out, rewetting and scouring action are required. It is recommended by the manufacturers for vat or pad dyeing, for package dyeing and dyeing operations in general to give greater uniformity of shade. Added to printing pastes it is said to improve penetration

and give better fastness to soaping. Hartofol C finds application in such textile processing as raw wool scouring; wool carbonizing; wool piece goods dyeing; rayon, acetate and cotton boil off; rayon and acetate dyeing as a wetting-out agent; and print washing and dyeing.

• PTI Foundation Appeal

Colonel Millard D. Brown, President of The Philadelphia Textile Institute Foundation, recently announced that construction on the new Philadelphia Textile Institute, for which ground was broken on September 15th of this year, is now more than twenty per cent complete. Work on the building is proceeding as scheduled and the new home of Philadelphia Institute will be ready for occupancy and operation for the Fall term of 1949.

"We are now appealing to the textile industry for funds not only for the completion of this main building, but to provide dormitories, new equipment, an auditorium, and endowment as well", said Colonel Brown. "We feel that the industry will not fail to give its unstinting support to the new school in view of the very tangible evidence of our plans now on the School Lane site.

"Under the leadership of Charles W. Carvin, we are going to the entire industry for subscriptions to meet the immediate and later needs of the new Institute, which can be pledged over a period of two or three years where desired."

The Foundation is furnishing all its prospective contributors with a new brochure, which not only outlines the needs of the Institute in detail, but shows as well an entire campus study indicating the various buildings to be erected. This presentation also furnishes floor layouts for the main building identifying all departments of the new school now under construction.

• New Bulletin on Dillon Model "L" Tester

This four-page Bulletin brings information to testers of virtually any type of material from fabrics to strong metals used in industrial production. It describes the portable Dillon Model "L" Universal Tester, a precision instrument of seven different ranges, for testing materials of tensile strength from a few pounds to 160,000 pounds, p.s.i. It also shows by photographs the construction for tensile, compression, transverse and shear testing; describes the handling of flats and rounds, fixtures for fabrics, cord, rope, wire, wood, and adhesives, and illustrates the dynamometers interchangeable for all capacities. Copies of the bulletin may be had on request from the manufacturer, W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill.

David O'Keeffe

• O'Keeffe Elected President of Chemicolloid Laboratories

David O'Keeffe was elected president and general manager of Chemicolloid Laboratories, Inc., 44 Whitehall Street, New York 4, on December 8th. He succeeds George H. Rider who organized the company in 1924. Mr. Rider becomes Chairman of the Board of Directors and retains his position as Treasurer.

George H. Rider

Chemicolloid Laboratories was organized to promote, develop and find usage for the invention of Baylis M. Dawson and eventually produced the Charlotte Colloid Mill. The first mill was produced in Charlotte, North Carolina under Mr. Rider's supervision in conjunction with the Charlotte Chemical Laboratories. The Charlotte Chemical Laboratories, owners of the Dawson patent, became manufacturers of the Dawson Colloid Mill, the name later being changed to the Charlotte Colloid Mill. During the years 1925-26-27 Chemicolloid Laboratories acted as sales distributors, soliciting samples from over sixty industries and working in their New York laboratories finding uses for the mill. In 1928 Chemicolloid Laboratories was incorporated and patents, patterns, drawings, etc., were moved to New York where the mill has since been manufactured.

In 1931 the design of the mill was slightly improved and no further change was made until the present time. It is stated that the latest design will simplify the mill further and make it easier to take apart and assemble. A new gas seal is included in the new mill which is said to make the further use of packing of any kind unnecessary. It is claimed that this will eliminate shaft wear and consequent friction which at high speed causes heat and uses considerable excess power.

• Antara Appointment

Richard F. Tomlinson, who joined Antara Products, a division of General Aniline & Film Corp., 2½ years ago as assistant to the advertising manager, has been appointed advertising manager of the division, it was announced recently.

According to Mr. Tomlinson, the division's entire line of detergents and emulsifiers now will be sold entirely to industry. This is in line with a company policy which revealed a few months ago that Antara products no longer would be promoted in the consumer field.

First promotional efforts under the new policy will feature the Antaroxes, which belong to the chemical family of aromatic and aliphatic polyglycol esters and ethers and have many industrial applications as detergents, wetting agents and emulsifiers. One of the most famous of all Antara products, "Glim," the liquid dishwashing detergent, was sold recently to B. T. Babbitt, Inc.

Mr. Tomlinson, who was instrumental in the introduction of "Glim" to the public, is a Babson graduate. He served in the Army Air Forces during the World War II. His offices are at 444 Madison Avenue, New York City.

• ASA Appointment

George Porter Paine has been appointed Director of Promotion of the American Standards Association, it was announced recently by Vice Admiral G. F. Hussey, Jr., USN (Ret.), Secretary. He will continue to act as Executive Assistant to Howard Coonley, Chairman of ASA's Executive Committee. Increased financial support from industry coupled with improved services to ASA's membership is being emphasized in the current activities of the Association.

Mr. Paine has been connected with The John Price Jones Corporation of New York, and was on the staff of the National Association of Manufacturers prior to the war. He served with the Navy in the South Pacific and Atlantic theatres, and is a Lieutenant Commander in the United States Naval Reserve. He is a graduate of the Wharton School of Finance and Commerce of the University of Pennsylvania.

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The famous artist, Ben Stahl, has reproduced, in this painting, one of a new group of basque suits tailored by Rosenblum from coverts and gabardines woven by American Woolen Co.

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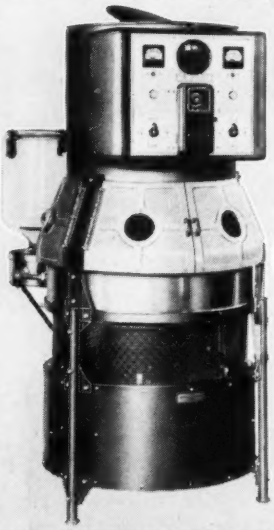

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American Dyestuff Reporter will publish

FOUR SPECIAL ISSUES

MARCH 7th — TEXTILE WET PROCESSING EXPOSITION, which will be held in the 71st Regiment Armory, 34th Street, corner of Park Avenue, New York City, MARCH 21, 22, 23, 24, and 25, 1949.

APRIL 18th — KNITTING ARTS EXHIBITION to be held in Atlantic City, New Jersey, APRIL 25th through 29th, 1949.

OCTOBER 3rd — A.A.T.C.C. CONVENTION NUMBER, covering the Annual Meeting and Convention to be held in Atlantic City, New Jersey, OCTOBER 13th to 15th, 1949.

DECEMBER 12th — ANNUAL PROCESSING REVIEW NUMBER. This issue as usual, will feature all new dyestuffs, chemicals, processing equipment, etc., developed during 1949.

Advertisers desiring to use these special issues should make space reservations now.

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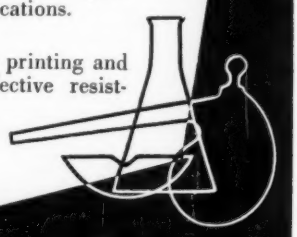

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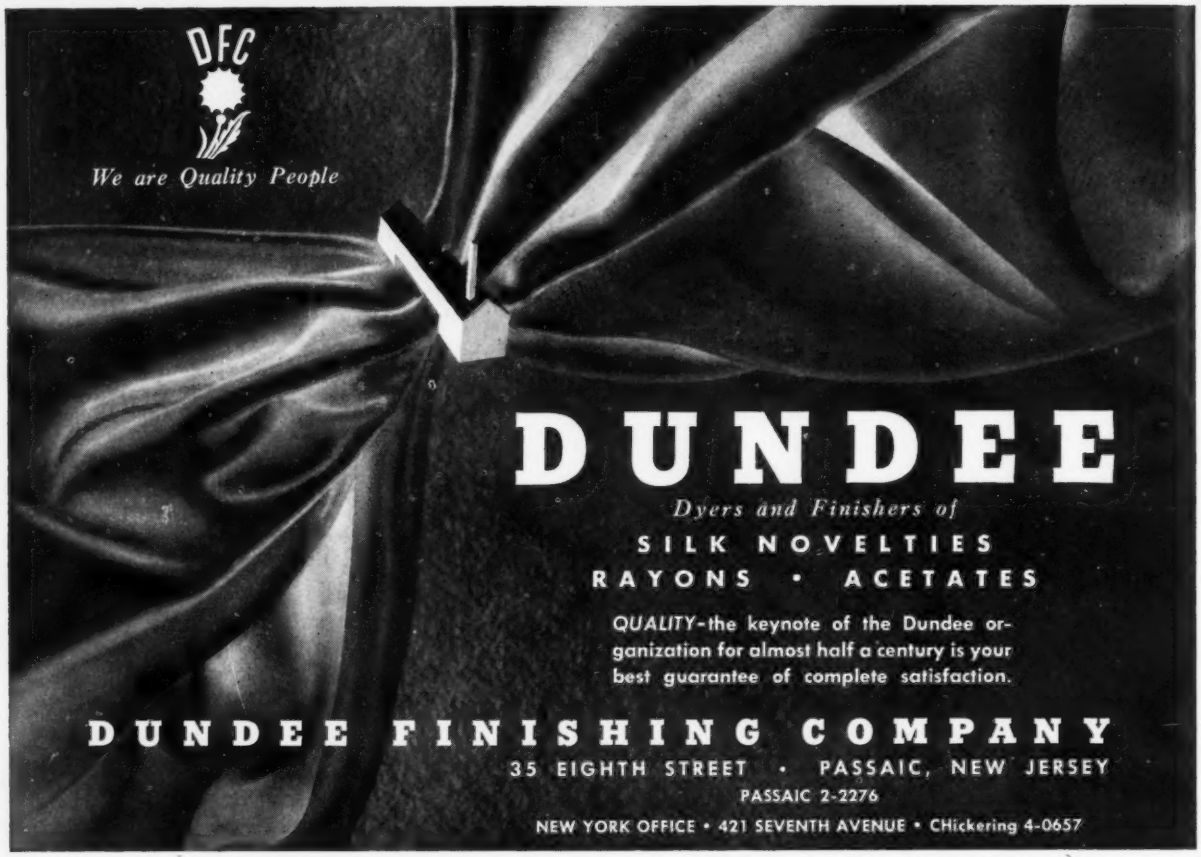
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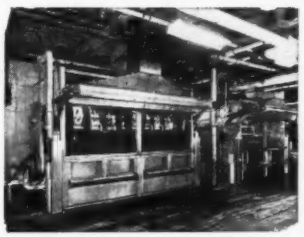

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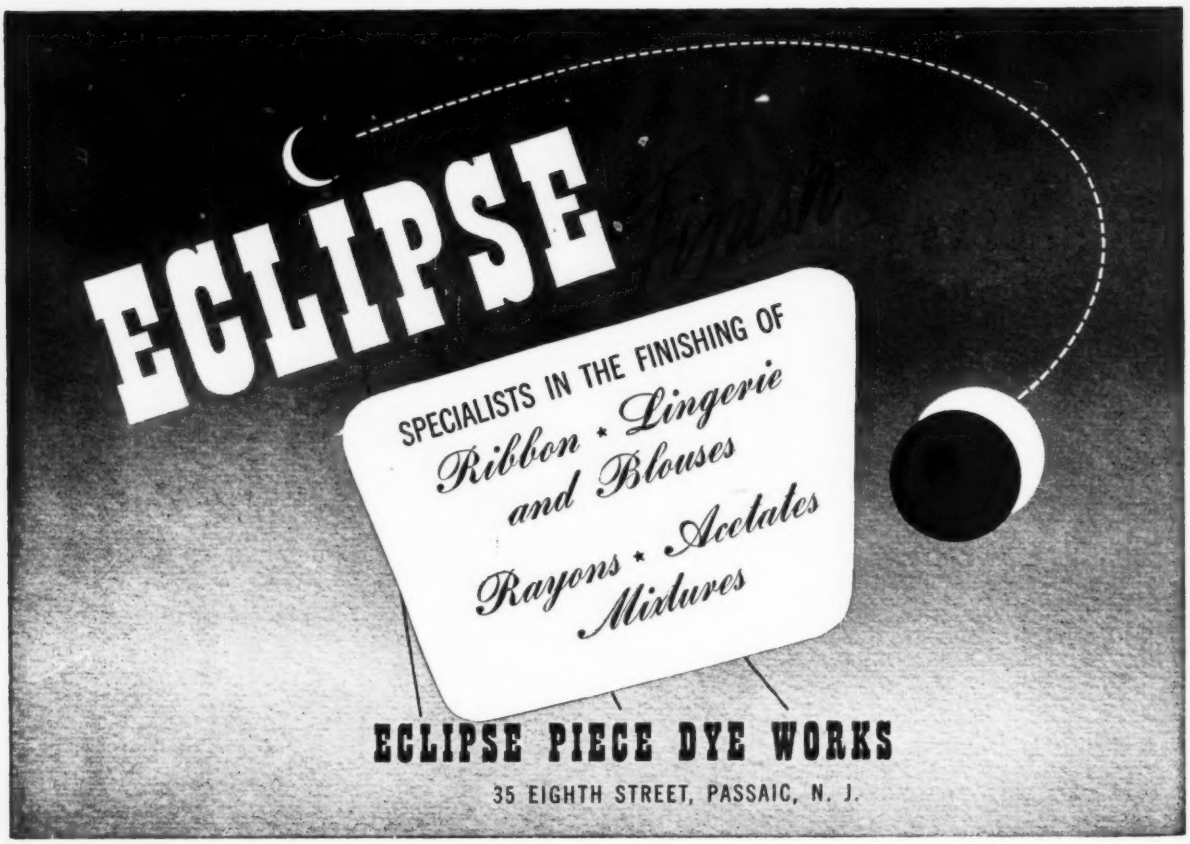
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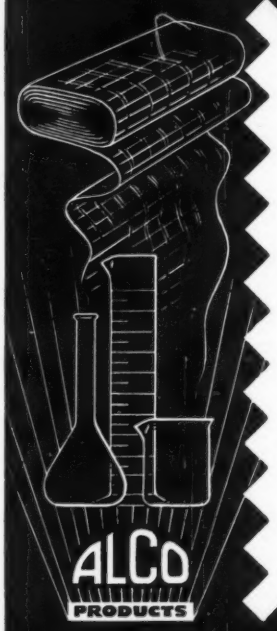

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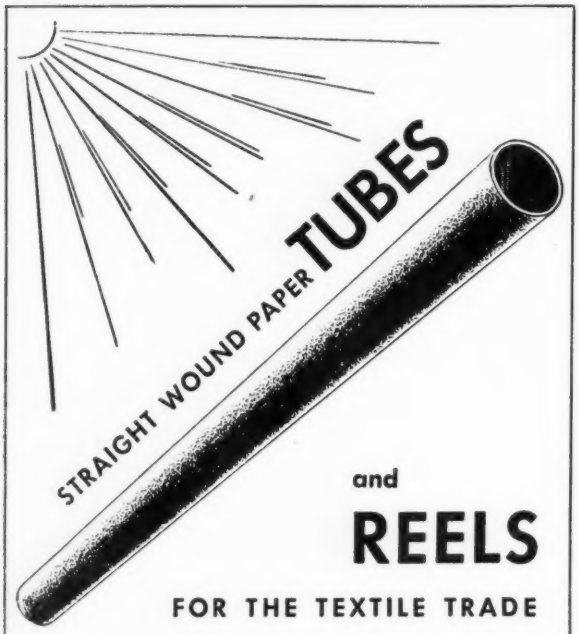

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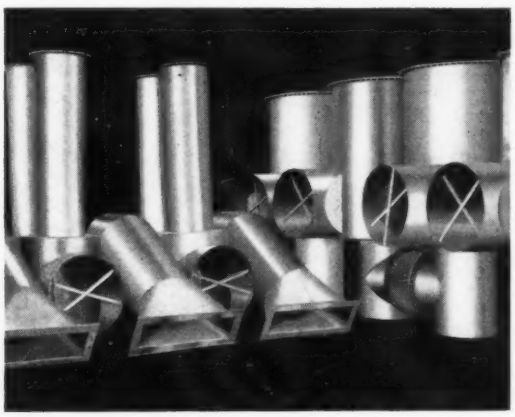

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CONFIDENTIAL EMPLOYMENT SERVICE: For Dyers, Chemists, Colorists, Managers, Superintendents and others seeking positions and for employers seeking men. Many positions paying attractive salaries open for capable men. Charles P. Raymond Service, Inc., 294 Washington St., Boston, Mass. Over 50 years in business.

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TEXTILE CHEMIST: Well established manufacturer NYC area seeking textile chemist with extensive knowledge and experience in manufacture and development of textile auxiliaries. Knowledge of dyeing and finishing preferable. Excellent prospects for right man. Write Box No. 420.

POSITION WANTED: Foreman Dyer, Chemist Lowell Textile Institute graduate 1943. Experienced narrow fabrics and piece goods including spun rayons, acetates, wool-rayon blends. Also laboratory experience. Now employed as Foreman Dyer at nationally known synthetic piece goods plant. Executive caliber, Metropolitan area preferred. Veteran. Write Box No. 551.

WANTED: Organic Chemist to execute phases of research on dye structures and properties for established organization. Recent graduate preferred. Must be acquainted with modern techniques of synthesis and with newer physical methods for determining molecular and structural properties. Position affords opportunity for close co-operation with industrial and scientific organizations. Located in Philadelphia area. Statement as to salary expected and to prior training and experience to be furnished. Write Box No. 553.

POSITION WANTED: TEXTILE RESEARCH CHEMIST, 9 years director; experienced research, development, quality control and control laboratory desires responsible position in laboratory or production. Write Box No. 560.

TEXTILE CHEMIST—Research and development work in a well-established Northeastern New York concern. Dyeing and processing experience on natural and synthetic fibers preferred. In replying, state age, training, experience and give references. Write Box No. 562.

WANTED: Textile Technologist with prior experience in textile plant laboratory and finishing department to execute phases of research in finishing textile fabrics. Experience in cotton textiles preferred but wool or synthetic experience will be considered. Prefer younger man with creative imagination and ability to carry out newer ideas and techniques. Contacts with industrial, technical and scientific groups afforded. Opportunity to develop along technical and managerial lines. College chemistry or textile school background desired. Position in Philadelphia area. Statement as to salary expected and to prior training and experience to be furnished. Write Box No. 554.

Do you need an expert to produce for you the latest textile chemical specialties? A chemist and chemical engineer who will keep you abreast of the latest developments? Address Box 558, care of this publication.

POSITION WANTED: Chemist, 20 years experience in chemical control of piece goods dye houses handling synthetic fibers and mixtures with knowledge of application of dyestuffs, auxiliaries, resin, finishes and quality and cost-control, seeking position, preferable N. Y. C. metropolitan area.

Write Box No. 567

• CLASSIFIED ADVERTISEMENTS •

WANTED: Textile Chemist-Colorist by dyestuff manufacturer in New Jersey for standardizing laboratory. Experienced preferred but not necessary. Write Box No. 563.

FINISHER WANTED

Nationally known textile organization in south wants a qualified finisher who has had experience on flat goods and underwear crepe. Man should have very sound synthetic fabric background. Please write giving full particulars on experience, background and some indication of salary desired. Write Box No. 564.

WANTED: Experienced dyestuff salesman to handle a complete line for a well established firm located in the New York area, with progressive ideas towards the future. State age, experience, technical training, etc., and salary desired. Write Box No. 565.

WANTED: Chemist-Textile laboratory experience, group leader type-surface active agents. Ph.D. preferred. Good future. Write complete details to Box No. 566.

WANTED:

Technical Sales Representative for Southern territory by old established chemical manufacturer. An unusual opportunity for a man having following qualifications: At least five years selling experience, actual textile mill experience preferred but not essential. Must have a knowledge of dyeing and finishing. Territory open Virginia, North and South Carolina. Established business. Car furnished. Only experienced men need apply. Salary commensurate with ability. References required, treated confidential.

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WANTED: Young man with basic technical training to grow into a position as sectional supervisor of dyeing and finishing of knit fabrics from wool, cotton, rayon and nylon. Opportunity for rapid advancement. Location—East Central New York. Write Box No. 569.

WANTED: LIVE WIRE. One with contacts among textile printing, dyeing and finishing trades to sell paper. Grand opportunity for right man.

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JUNE	13-27
JULY	11-25
AUGUST . . .	8-22
SEPTEMBER .	5-19
OCTOBER . . .	3†-17-31
NOVEMBER . .	14-28
DECEMBER . .	12‡-26

OFFICIAL PUBLICATION, PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

†A.A.T.C.C. Convention Issue
‡Annual Processing Review Number
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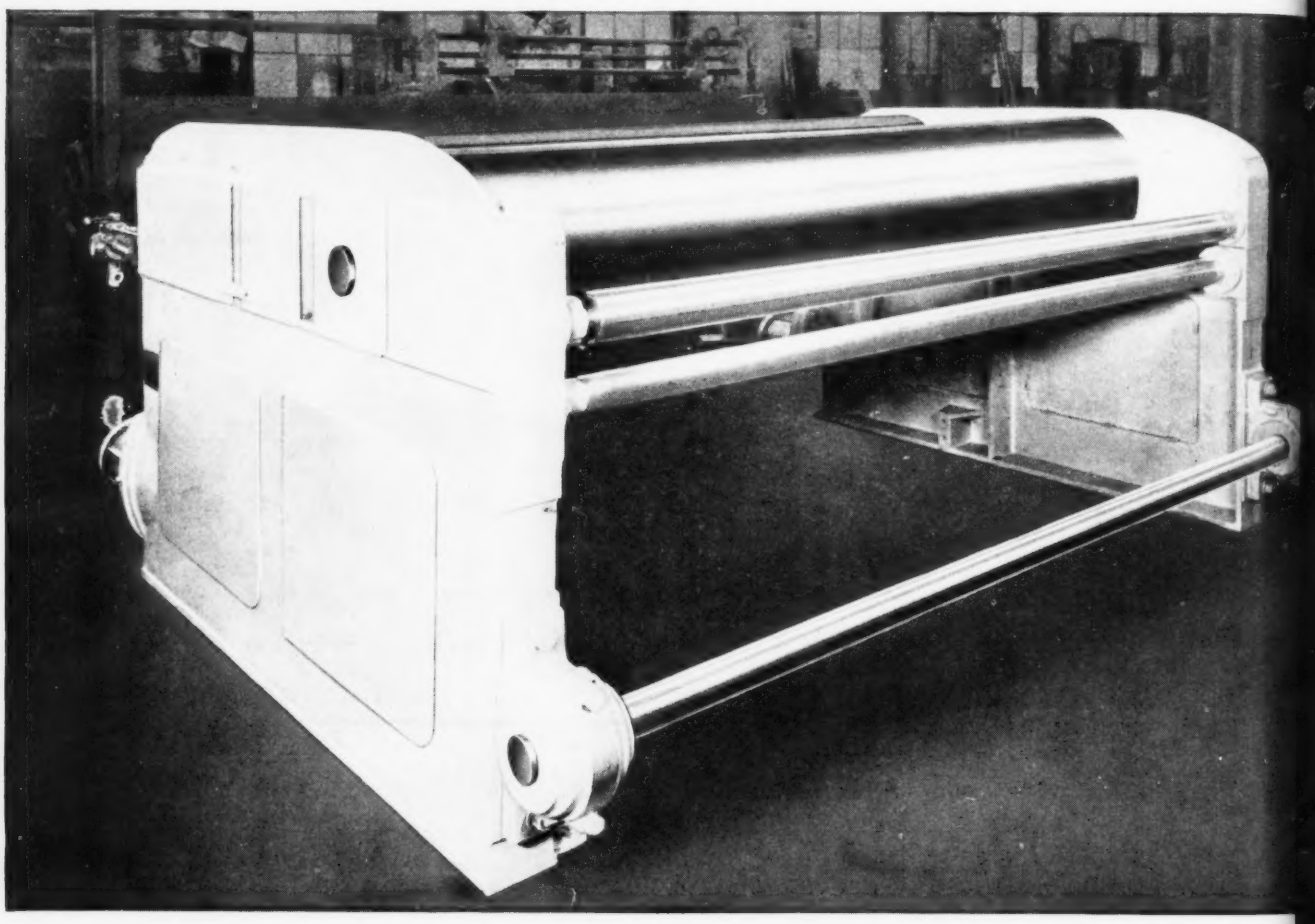

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